JULY 1972

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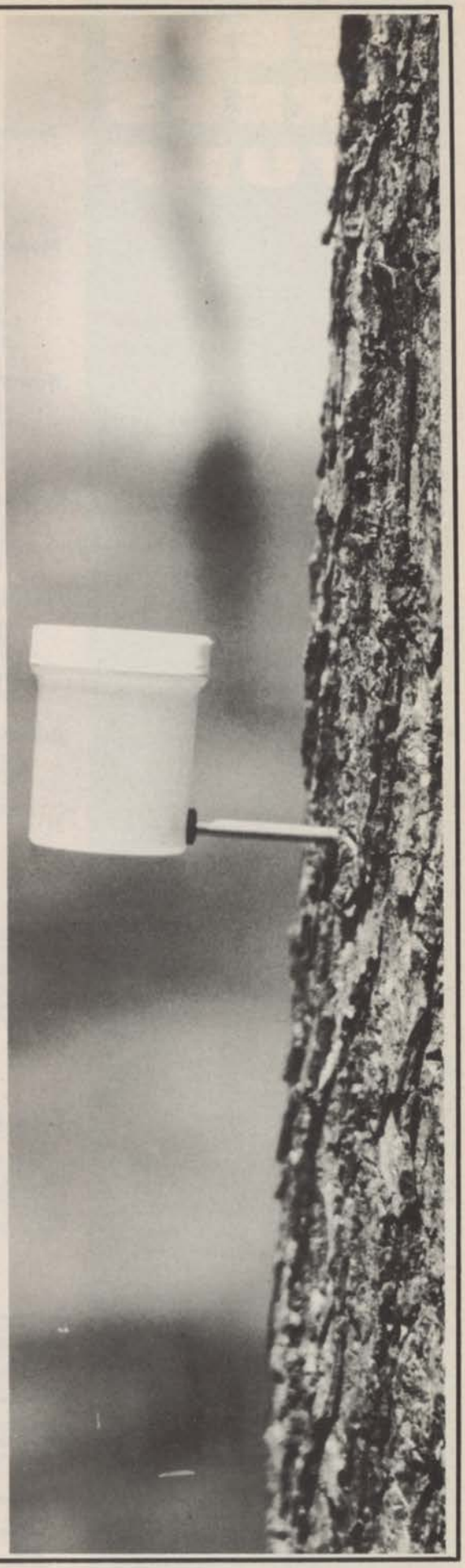

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WEEDS TREES and TURF

Volume 11, No. 7 July, 1972

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Aquatic Weed History—Century Old Problem 12
Aquatic weeds have plagued southern waterways during the past 100 years. Julian J. Raynes of the Army Corps of Engineers reviews this interesting history highlighted by progress and failure along every nautical mile.

Modern Biocides—A New Dimension To Water's Complex Environment 14
Without chemicals water is a sterile environment and is unable to support many beneficial uses. Dr. Charles R. Walker, chief, branch of pest control research, division of fishery research, discusses the complexity of water and the critical relationship which exists among aquatic plants and fish.

How We Reduced Drift With Aquatic Herbicides 16
A first-hand report on the performance of Directa-Spra, Amchem's new spraying system. Vernon Meyers of the Florida game and fresh water fish commission reviews his aquatic herbicide trials using the Directa-Spray system.

Even In Las Vegas—You Can't Gamble With Turf 18
Read how golf superintendent Jim Connally combines management skill and basic golf course knowledge to make the Desert Inn Country Club one of the top courses in the nation.

Florida's $2.8 Million Aquatic Plant Research And Control Program 20
Aquatic plant control is big business in Florida. Dr. Alva P. Burkhalter, coordinator, aquatic plant research and control, department of natural resources, reports on the program that combines research, matching funds and control to rid the State of noxious aquatic weeds.

Aquatic Herbicides—New Possibilities 26
Although development has been somewhat curtailed, new herbicides and new uses for established herbicides show promise in controlling aquatic plants. Dr. Robert C. Hiltibran of the Illinois Natural History Survey presents his findings on these candidates.

Editorial 6
Government News/Business 10
Letters to the Editor 25
Industry People on the Move 31
Meeting Dates 39
New Products 41
Sod Industry Section 44
Insect Report 47
Classifieds 53
Advertisers Index 53
Trimmings 54

The Cover

The Aquatic Weed Patrol in action. Winding his way through a channel in one of Louisiana's natural fresh water lakes, Floyd Reeves, Louisiana Wildlife and Fisheries Commission is prepared to spend a day spraying aquatic weeds. Typical of this operation, applicators commonly use small boats or airboats to apply chemicals.

WEEDS TREES and TURF is published monthly by The Harvest Publishing Company, subsidiary of Harcourt Brace Jovanovich, Inc. Executive, editorial headquarters: 9800 Detroit Ave., Cleveland, Ohio 44102.

Single Copy Price: $1.00 for current and all back issues. Foreign $1.50.

Subscription Rates: WEEDS TREES AND TURF is mailed free, within the U.S. and possessions and Canada, to qualified persons engaged in the vegetation care industry and related fields in controlled circulation categories. Non-qualified subscriptions in the U.S. and Canada are $10.00 per year; other countries, $12.00 per year. Controlled circulation postage paid at Fostoria, Ohio 44830.

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Editorial — Safety Abuses

Travel any of our nation's highways and interstates this summer and you will witness some of the most flagrant violations of safety known to man. Cars loaded well beyond the limit of endurance of springs and tire carrying capacities, trailers with oversized loads so large that they dwarf the tractor pulling them yet displaying only a small red and white bandanna handkerchief as the only visible safety signal, off-the-road vehicles creating a mud trail that lasts for miles and weeks, are but a few of the annoying signs.

While we see these abuses almost daily, our concern lies in another area highly visible but seldom noticed — until too late. Highway repair equipment of all shapes and descriptions constitute one of the most dangerous obstructions to the traveling motorist today. The congregation of trucks, vehicles, graders, rollers and a host of other equipment congest a stretch of road shoulder, pavement and rights-of-way to the point of physically blocking traffic movement.

The feeble attempt to post signs ahead of the work area often go unnoticed because many are placed too close to the traffic flow and consequently blow down or signs are not explicit enough to warn the motorist.

On closer inspection of the actual work site, we have noticed that in the majority of cases few, if any, of the heavy vehicles sport the slow moving vehicle (SMV) emblem required by the Occupational Health and Safety Act (OHSA). One mechanical roller sighted on an Indiana interstate displayed a SMV sign, but the dirt and grime had covered all but a small portion of the triangle. In addition, the operator was bare-headed and working next to an unmarked strip of highway.

In stark contrast to this scene are the crews who maintain highway rights-of-way. In all but an isolated instance or two, these dedicated men have assessed their job from the safety angle and conformed with the Occupational Health and Safety Act. Nearly all tractors display the SMV emblem either on the rear of the tractor or in a prominent place on the mower. Crews are wearing hard hats and in many cases safety shoes.

We commend the maintenance crews and their foremen for taking the initiative in the 1972 safety campaign. The safety meetings and information presented on OHSA have improved the safety standards of this job. We believe that highway construction crews, both private contractors and highway employed personnel should observe these safety standards more closely. Fewer accidents result when engineers, foremen and crews make safety part of their working team.

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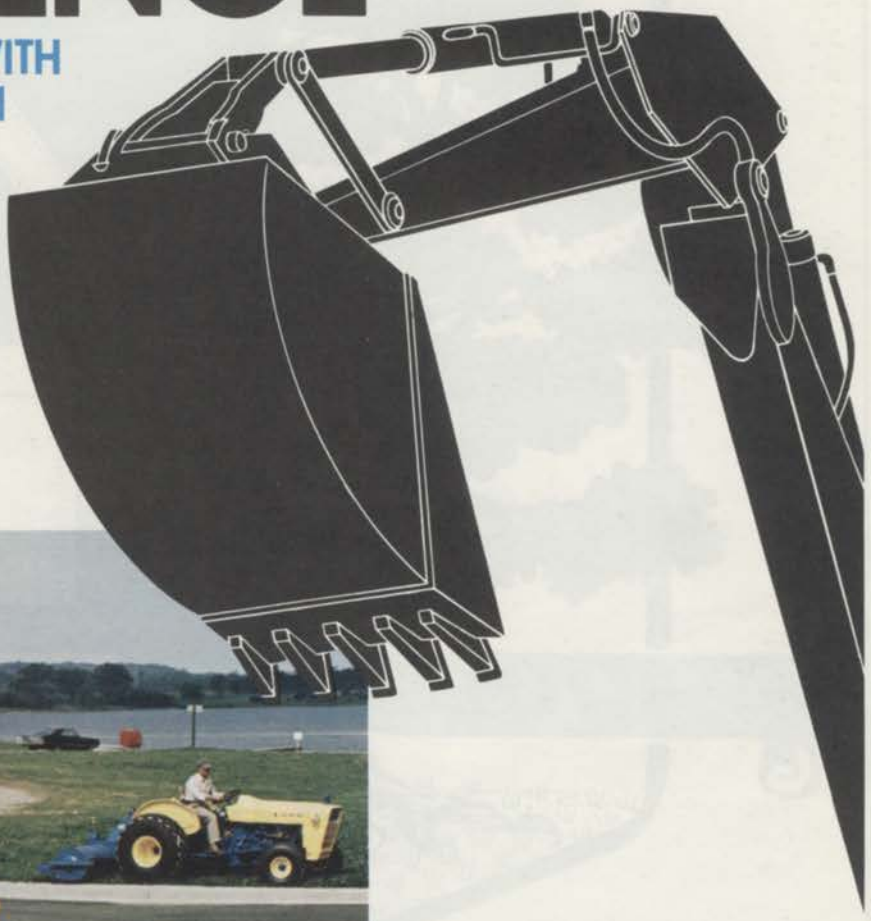

Many backhoes dig only with the curl of the bucket. They scoop instead of dig.

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Government News / Business

U.S. District Judge Charles R. Scott has thrown out two Florida court lawsuits against chemical spraying of water hyacinths on the St. Johns River. The controversy arose when seven persons filed suit in federal court for an injunction against the use of 2,4-D to kill hyacinths. Defendants named were Army Corps of Engineers Stanley R. Resor, his chief of engineers Lt. Gen Frederick J. Clarke, and the head of the Environmental Protection Agency William D. Ruckelshaus. Witnesses for the Corps said that other means of controlling hyacinth are being studied but so far they are experimental and spraying remains the only effective measure. It was pointed out that spraying of hyacinths was stepped up this year because the mild winter had resulted in rapid growth in the headwaters of the river. The danger of an emergency would dislodge the plants and impede river traffic. Judge Scott ordered the Corps to complete by next Dec. 31 an impact statement showing the effects of the chemical spray on the environment.

Overruling the findings of Edmund Sweeney, William D. Ruckelshaus, EPA Administrator, closed the lid on the DDT coffin. He decreed that "the continued use of DDT involves, over the long run, an unacceptable risk to the environment and possibly man's health." Sweeney had concluded that the benefits of DDT outweighed the risks. But while the environmentalists were toasting the victory, 27 manufacturing firms filed an appeal in the Fifth Circuit Court of Appeals in New Orleans. The issue has now returned to the courts for settlement.

Gypsy Moth quarantine regulations have been extended to include mobile homes and recreational vehicles. USDA previously ordered that timber, plants and similar products could not be moved from regulated areas unless free of gypsy moth. The mandate which now includes mobile homes and recreational vehicles was issued partly in response to finding gypsy moth larvae in a mobile home park in Missouri. New residents to the park had moved from Connecticut and transported larvae in the trailer.

The wrong advise can cost you. A retailer paid part of the loss to a homeowner who used the wrong weed killer on his lawn which resulted in the elimination of weeds, trees and turf. Although the package label contained the appropriate warning, the retailer was required to pay part of the loss. The rest was tax-deducted over IRS objections.

The Office of Management and Budget has recommended that the Environmental Protection Agency charge fees for registering pesticides and boost fees for establishing residue tolerances. Representatives of the National Agricultural Chemicals Association, Chemical Specialties Manufacturers Association and others have voiced strong objections to this proposal.

Wage-Price Laws now exempt small businesses employing 60 or fewer persons. Donald Rumsfield, Cost of Living Council Director, says about 5 million small firms will be affected. All price and wage increases are now restored for these firms. Rumsfield emphasized that the exemption was not a move to "decontrol."

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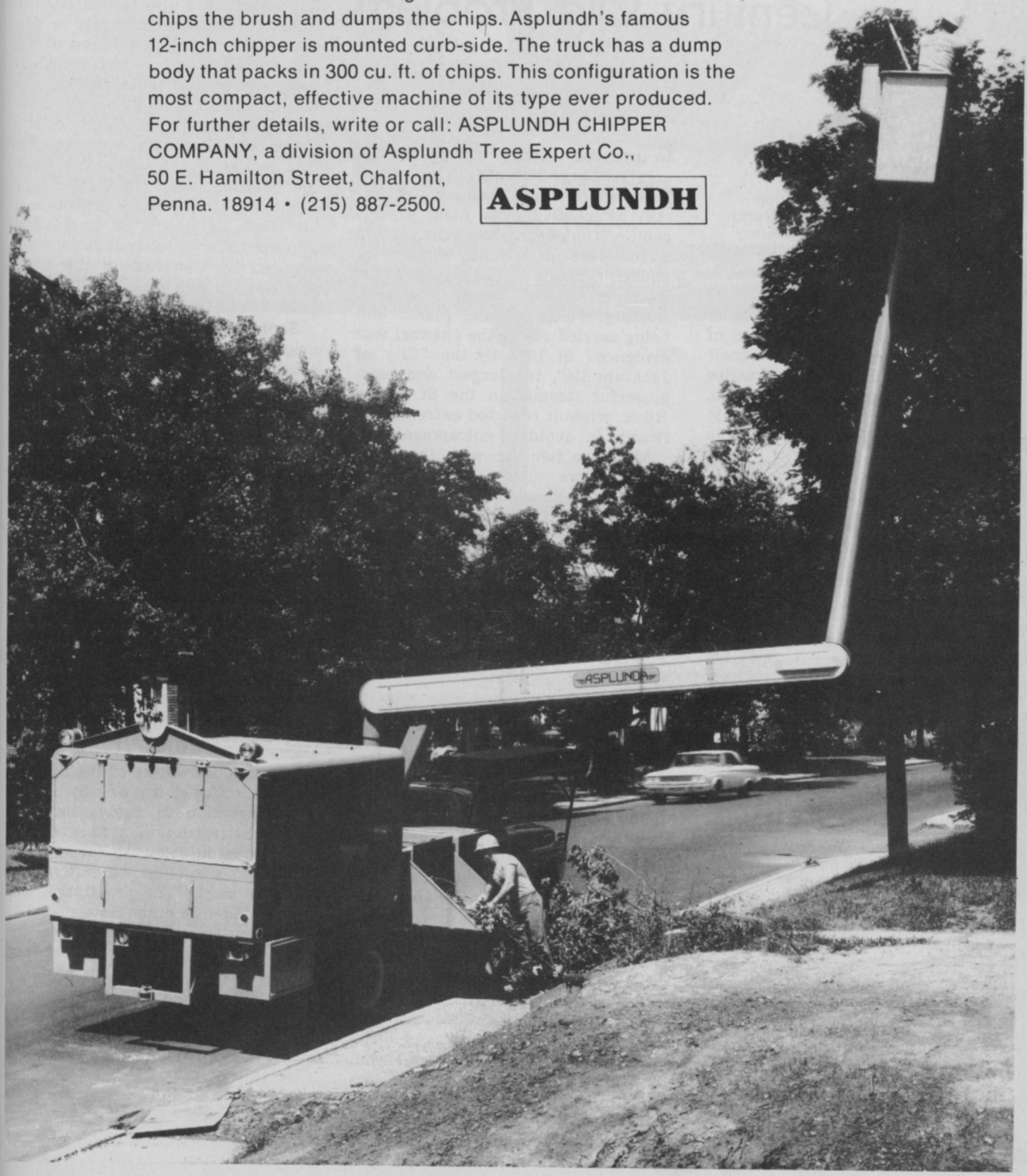

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Aquatic Weed History

Century Old Problem

By JULIAN J. RAYNES
Assistant Chief
Civil Land Planning Section
Environmental Engineering Branch
Engineering Division, U.S. Army
Engineer Division, South Atlantic

THE words "obnoxious aquatic plants" conjures up visions of waterways, rivers, streams, and their tributaries, all choked with water hyacinth, alligatorweed, Hydrilla, Eurasian watermilfoil and many, many other species of undesirable aquatic plants.

The vision would not be complete if we did not include the many boats and barges stuck in the vegetation and moving with vegetation as directed by the wind; or the flood waters which are being retained on land areas because floodways are choked with aquatic vegetation; or the agricultural crops suffering extensive damages because of the lengthy periods of flooding resulting from clogged drains choked with aquatics; or the untold losses to wildlife and fisheries as a result of coverage of open waters and blanketing of marshlands by obnoxious plants; or the reduced flows of life giving water in choked irrigation ditches. We must not forget these visions because they can become reality again in short order if neglected.

We are a nation subject to cause and effect. The history of aquatic plants or weeds in the Southeast is the result of cause and effect. In 1896, the large masses of water hyacinths in the St. Johns River in Florida and some of the main rivers in Louisiana created serious navigation problems and the Congress was made aware of the problem. It was reported that small boats with screw propellers found it impossible to penetrate large masses of hyacinths. Large steamers going at full speed would come to almost a standstill after striking a bank of hyacinths. Condensers used for cooling water were often times clogged by aquatic plants. The danger of steamers being caught between floating masses of the plants and being carried out of the channel was evidenced in 1896 by the "City of Jacksonville", the largest and most powerful steamer in the St. Johns River, when it reported extreme difficulty in avoiding entrapment.

Most are familiar with the story that visitors to the New Orleans Centennial Exposition in 1884 carried the beautiful hyacinth to their homes where it flourished. One document relating to Florida states that as nearly as can be learned, water hyacinths were first introduced into the St. Johns River about 1890 at Edgewater about four miles above Palatka. Within six years, the problem became so acute that the War Department was asked to investigate the situation.

In accordance with Congressional authority, a Board of Officers was appointed in 1897 for the purpose of investigating the extent of obstructions to navigable waters of Florida, Louisiana, and other states by water hyacinths and performing such experimental work as necessary to determine a feasible plan for removing such obstructions. The records of that Board state that one of the members, when in charge of certain river and harbor work in Louisiana some 20 years previously, had observed the plant and its peculiarities and that it was then believed to be flourishing in the Atchafalaya Basin. This would place water hyacinth as flourishing in Louisiana about 1877 which is six years before the New Orleans Centennial Exposition!

Engineers of the U. S. Army Engineer District Office, then located in St. Augustine, Florida, recommended the construction of a mechanical crusher boat. The Board of Officers adopted this recommendation and further advised the use of log booms as an adjunct and suggested utilizing nature by drifting the plants out to sea.

The Board also conducted the earliest known chemical tests for control using muriatic, sulfuric and even carbolic acids. Kersosene and hot water were also tested. Nothing effective was found except a prohibitively expensive solution of salt and quicklime which destroyed both roots and tops in 48 hours. This cost was estimated to be $100 per acre.

Subsequently, the Chief of the Corps of Engineers recommended that two crusher boats be built, one for Florida and the other for Louisiana at a cost of $25,000 each and that log booms be used as an adjunct. The recommendation was adopted by Congress in the River and Harbor Act approved March 3, 1899.

Shortly after the adoption of the original project, a mechanical crusher boat was constructed; however, in 1902 the crusher boat was abandoned because of its inability to cope with the rapid rate of spread of the plant and the demonstrated need for destruction of far greater capacity. In the meantime, the value of sodium arsenite for killing these plants had been demonstrated and since it appeared to offer the extra capacity needed it was adopted for use.

Sodium arsenite was used for hyacinth control even though it was known to be toxic to man and animals. As a result of protests by cattlemen in Florida, the River and Harbor Act approved March 3, 1905, in appropriating funds for "the removal of the water hyacinths from the navigable waters of the State of Florida, so far as it is or may become an obstruction to navigation", imposed the restriction "that no chemical process injurious to cattle which may feed upon the water hyacinth shall be used." The prohibition was not extended to other states.

The un-retouched photos on the next page give a good idea of how aquatic weeds plagued our southern waterways during the early part of this century.

Records indicate that 23 chemicals were tested in 1906 in the search for chemical control. These included:

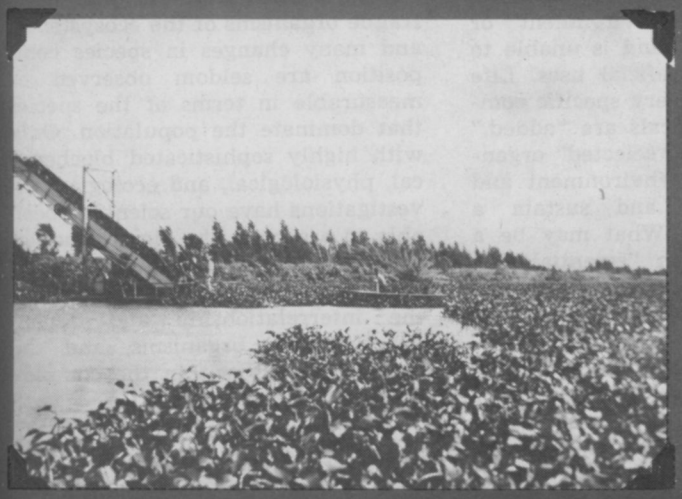
1. London purple
2. Arsenite of lime

(continued on page 22)

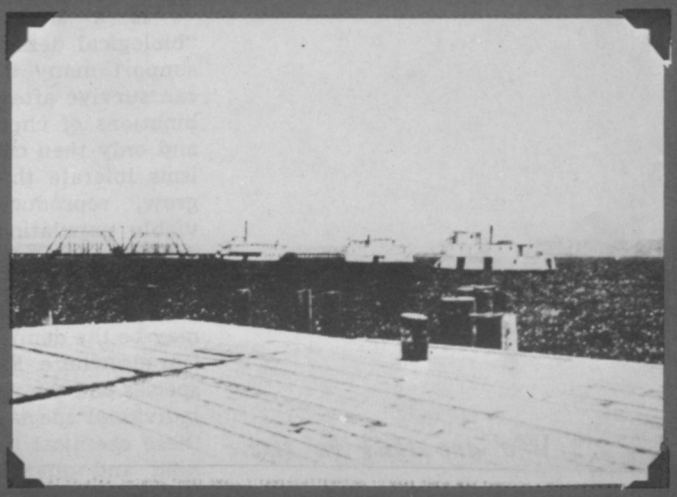
the good ol' days

Hyacinth conveyor No. 3 operates in the St. Johns River near Sanford, Fla. in September 1940.

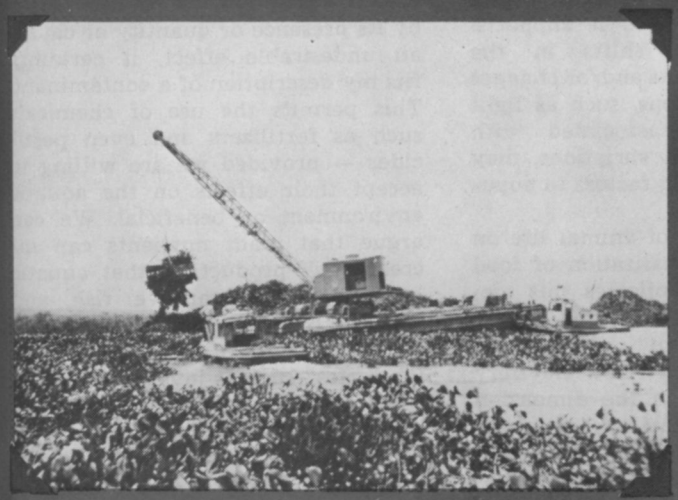
This photo taken on the north fork of the St. Lucie River shows a crane depositing hyacinths on the riverbank.



Removing hyacinths with a conveyor in the Hillsboro Canal in the late 1930's.



Three small steamers try to chart a course through hyacinths. The foreground of this un-retouched photo, taken around 1900, is the bridge at Palatka.



In 1927, equipment like this was used to remove hyacinths from navigation channels.

Hyacinth destroyer at work in Arbuckle Creek

Modern Biocides – A New Dimension To Water's Complex Environment

by DR. CHARLES R. WALKER
Chief, Branch of Pest Control Research
Division of Fishery Research
Washington, D. C.

. . . . We are still in the "cave man era" and our management tools are as crude as the stone axe or use of fire . . . .

WATER alone, without chemicals, is a sterile environment or "biological desert" and is unable to support many beneficial uses. Life can survive after very specific combinations of chemicals are "added," and only then can "selected" organisms tolerate this environment and grow, reproduce, and sustain a viable population. What may be a needed level of an "essential element" or "chemical condition" to one organism in one geographic location may be the demise of another organism elsewhere. Even the diversity of species and the population density of individual species vary according to these chemical constituents, both in kind and quantity, within specific ranges in concentration.

Thus, a critical relationship in the chemical character of water exists at all times with respect to both the plant and animal life it supports. Small, temporary shifts in the chemical constituents and/or changes in physical conditions, such as light and temperature associated with diurnal or seasonal variations, may pose serious limiting factors to populations.

The dependency of animal life on plant life and specialization of food habits further complicates this picture of the aquatic ecosystem.

The development of modern biocides has brought a new and very important change in the dimension of chemicals and their potential effects on the aquatic ecosystem—both for beneficial and harmful consequences. If the contaminates are toxic and persistent, they can create havoc, particularly on the more fragile organisms of the ecosystem—and many changes in species composition are seldom observed or measurable in terms of the species that dominate the population. Only with highly sophisticated biochemical, physiological, and ecological investigations have our scientists been able to ascertain the significance of the chemicals and effects on each species, the community microcosms, the interrelationship and dependence among organisms, and the flow of energy within the complex aquatic ecosystem.

What then is a contaminate of the aquatic ecosystem? There are probably as many definitions as contaminates. Webster's definition suggests *to make impure, unclean, pollute, corrupt, complete befoulment or decay.* If a substance is "out of place" by its presence or quantity or causes an undesirable effect, it certainly fits my description of a contaminant. This permits the use of chemicals such as fertilizers and even pesticides — provided we are willing to accept their effects on the aquatic environment as beneficial. We can argue that plant nutrients can increase fish production, that aquatic herbicides can improve fish and wildlife habitat, that certain pesticides can control "biological contaminates" such as invertebrates and vertebrates that are nuisance species, disease vectors, unwelcome competitors, or parasites. We feel justified in their use to provide better fish, hunting, and aesthetic qual-

(continued on page 24)

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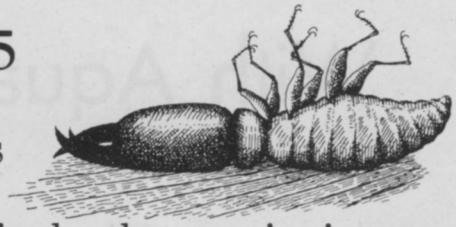
The line the bugs fall for.

Aldrite® 4 and Dieldrite® 1.5

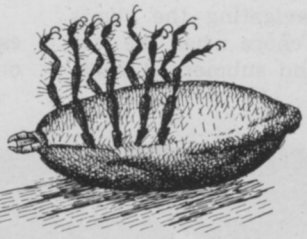


Insecticides were proven superior by university tests of Shell's termiticides. The tests proved conclusively that Shell's Aldrin is clearly superior in performance to all major competitive products for subterranean termite control. Second only to Shell's Dieldrin.

Akton® 2 Insecticide controls chinch bugs in turf for up to eight full weeks, rain or shine.

At 1¼ lbs. per acre, competitively priced Akton keeps turf green for up to ten full weeks.

Gardona® 75 Insecticide is tough on ticks. It controls them for up to nine full weeks with a surprisingly low order of toxicity to fish and mammals. Gardona can be applied with air or ground equipment.



Vaponite® 2 Insecticide rapidly reaches out and kills the toughest roaches. Vaponite's Vapona Insecticide vapors spread out into little nooks and crannies flushing roaches out and killing them rapidly.

Shell does a better job.

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How We Reduced Drift With Aquatic Herbicides

By VERNON MEYERS
Coordinator
Aquatic Weed Section
Florida Game and Fresh
Water Fish Commission

MY primary interest in fighting water weeds is the fish and wildlife aspect of it. We need *some* weeds for our fish but we can't let the plants get out of hand. Some of these weeds down here take over so fast, they choke up the waterways before you hardly know it.

Then, too, navigating the rivers can be a tough chore when the water hyacinths and submerged vegetation have taken over—not to mention what it can do to skiing, swimming, and helping to build mosquito populations.

That's why all of us aquatic weed specialists stay so busy looking for new and better ways to keep our waters weed-free.

Something that especially interests me is anything that cuts down on herbicide drift, even though we haven't had any big problems with that in the past. Unfortunately, the drift problems that have plagued the phenoxies since their introduction nearly 30 years ago continue to be a real worry, especially to people spraying rights-of-way. Drift from a right-of-way to nearby sensitive crops can do plenty of damage.

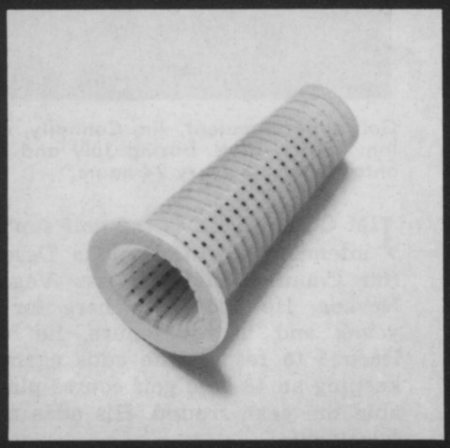
Concern with drift was why we

(Continued on page 48)

A small motor which operates from the 12-volt battery on the air boat, above, drives the Directa Spra unit. Arc of the spray pattern can be adjusted to 90, 180 or 360 degrees.

Directa Spra in action. Notice that the spray pattern is "wheel" shaped. Herbicide passes through the control box to the hub of the unit where it enters eight tubes which make up the delivery section. Nozzles may be attached to the tubes.

Why we spent $25,000 to develop a 10¢ grit screen.



It's a small thing. A plastic screen designed to fit under a spray head. Small. But important. Because all water contains debris. And debris will clog small nozzles and spray heads.

No matter what kind of spray heads you're using, you can use our filter. And it only costs a dime. Money well spent on a product nobody else offers.

But then, nobody else offers what Rain Bird offers. No one else makes the world-famous Rain Bird impulse sprinkler head. We've sold millions, and most of them are still working as well today as the day they were installed.

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Our 10¢ grit screen tells a lot about a company as big as we are. To get big, and stay big, you've got to sweat the small stuff too.

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GLENDORA, CALIFORNIA 91740

Even In Las Vegas . . .

You Can't Gamble With Turf

Golf superintendent, Jim Connally, checks the condition of the turf at the Desert Inn Country Club. During July and August he pumps a million gallons of water onto the course every 24 hours.

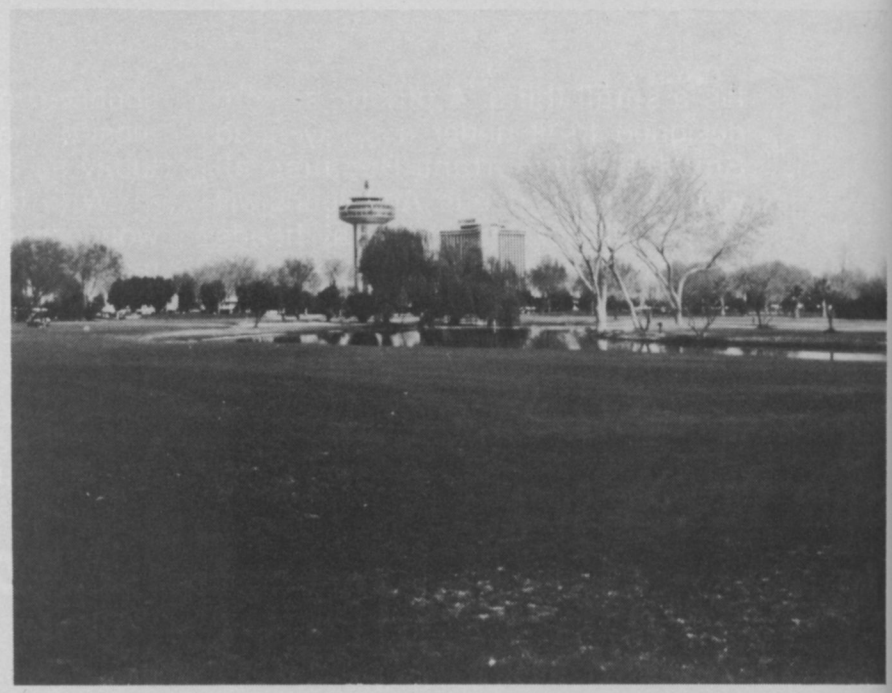
JIM CONNALLY is the golf superintendent at the famous Desert Inn Country Club in Las Vegas, Nevada. He has been there for 3 years, and in his tenure, he has learned to respect the odds against keeping an 18-hole golf course playable the year around. His odds are formidable.

To begin with, the climate is against him. He has measured ground temperatures up to 126 degrees F. in July and August. During these months, he isn't surprised to find the thermometer bouncing around the 100 degree mark at 6 a.m. During the milder winter period at Las Vegas—January and February—he may encounter a temperature of 20 degrees at dawn, and on the same day see it shoot up into the high seventies.

To complicate the picture, there

(continued on page 34)

Weed control is a big problem during the year for Jim Connally. Heavy player traffic on the course and a dry climate is an open invitation to crabgrass and goosegrass. This superintendent uses Dacthal, a broad-spectrum herbicide to control these problems.



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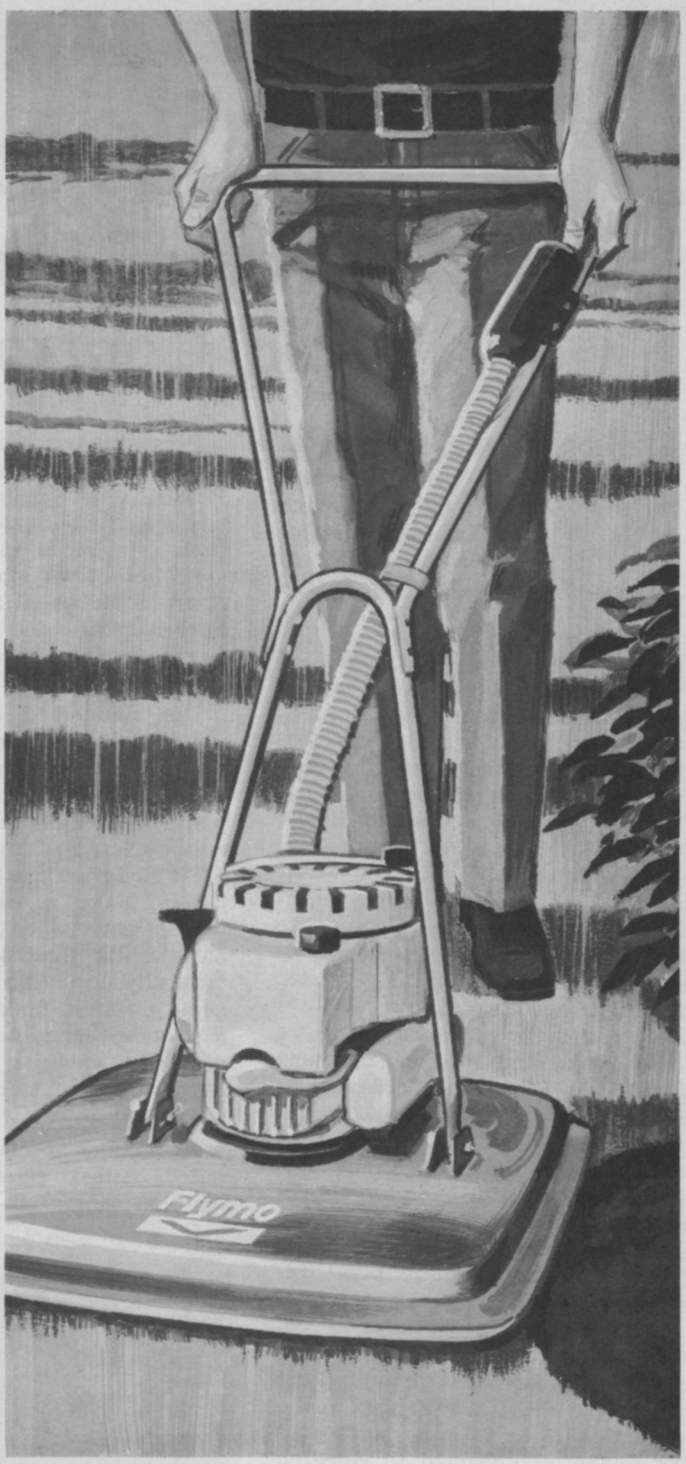
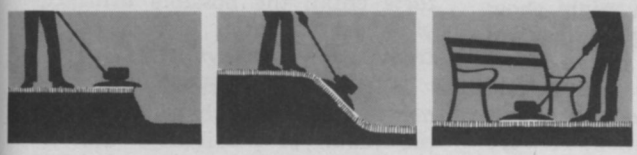
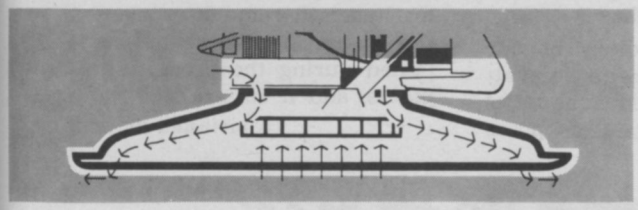
the world's only air-cushion mowers now in the U.S.



FLYMO FLOATS—TRIMS CLEAN AND CLOSE



Edgings, traps/Steep inclines, bunkers/Under benches, close to trees.



The Flymo impeller sucks in air and presses it to the edge of the hood covering the cutting blade. An air cushion is formed, lifting the machine and making it float. Under the cutting blade the upward return airstream raises the grass so that it is cut to the same height.

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Florida's $2.8 Million Aquatic Plant Research And Control Program

By DR. ALVA P. BURKHALTER
Coordinator
Aquatic Plant Research
and Control, Dept. of
Natural Resources
State of Florida, Tallahassee

THE FLORIDA Department of Natural Resources, Bureau of Aquatic Plant Research and Control, like many other agencies and individuals, is dedicated to the control of noxious aquatic weeds in Florida waters. Conservatively, 200,000 to 300,000 acres are infested, thus rendering many of our water bodies useless. Recreational activities, such as boating and fishing, are hampered. Efficiency of potable water reservoirs is declining. Water qualities, resulting from natural death and decay of the aquatics, are threatened, sand clogged drainage ditches pose potential flooding problems.

Last year the Florida legislature bolstered the Aquatic Plant Research and Control Program by directing $2.8 million of the boat registration fees and gasoline taxes for spending in aquatic plant research and control.

Currently the program is threefold: research, matching funds and control. Research in aquatic plant control has drastically lagged in the past; therefore, a large portion of the budget is allocated to research needs. At present our control efforts entail biological, mechancial and chemical systems. Current research projects sponsored or co-sponsored by the Department of Natural Resources include:

Utilization of the white amur (a herbivorous fish) as a potential tool is presently underway. Determination of the effectiveness of the amur as a biological control agent at various stocking rates, observation of the aquatic plant preference of the amur on water quality, and influence of the amur on other fish and invertebrate organisms are some of the areas under investigation.

Presently our most effective biological tool has been insect attack. Release sizes for insects and mites host specific on water hyacinth have been established in order to study subcolonization and establishment of these biological agents. Then the effectiveness, and factors which might enhance or reduce their effectiveness will be evaluated.

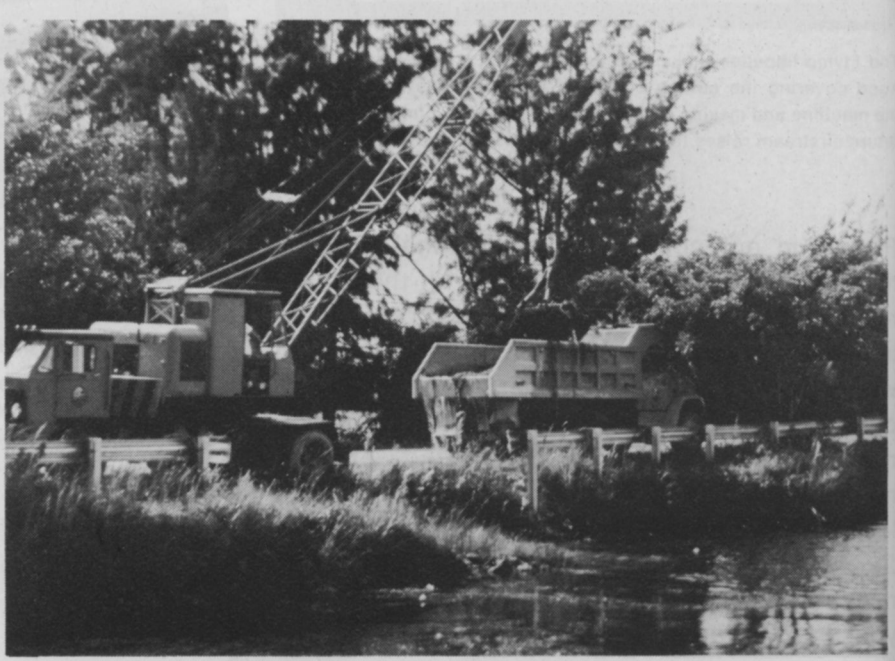
The submersed aquatics, particularly hydrilla, are fast becoming perhaps our worst problem. Studies are underway to establish the native home of hydrilla, its worldwide distribution, and pathogens, insects and other arthropods which might show potential as a biological control agent. Travels to the native home of hydrilla hopefully, will reveal naturally occurring insect or pathogenic enemies. In addition, surveys are being conducted for naturally occurring enemies of hydrilla and *Myriophyllum* in Florida.

The biology and ecology of our most noxious species are to be evaluated. Attack on noxious aquatics by microbiological organisms poses another potential tool. Such possible attack is under investigation. Also, a survey for compounds which occur naturally in plants and may retard susceptibility to attack is underway. By reducing these natural compounds, the plants would thus be more susceptible to attack.

The Department of Natural Resources is designing and building a high capacity mechanical harvester for water hyacinth to be stationed on the St. Johns River. A crimper-type hyacinth harvester is also under investigation. Other research efforts entail the possible utilization of these aquatics once removed from the waterways.

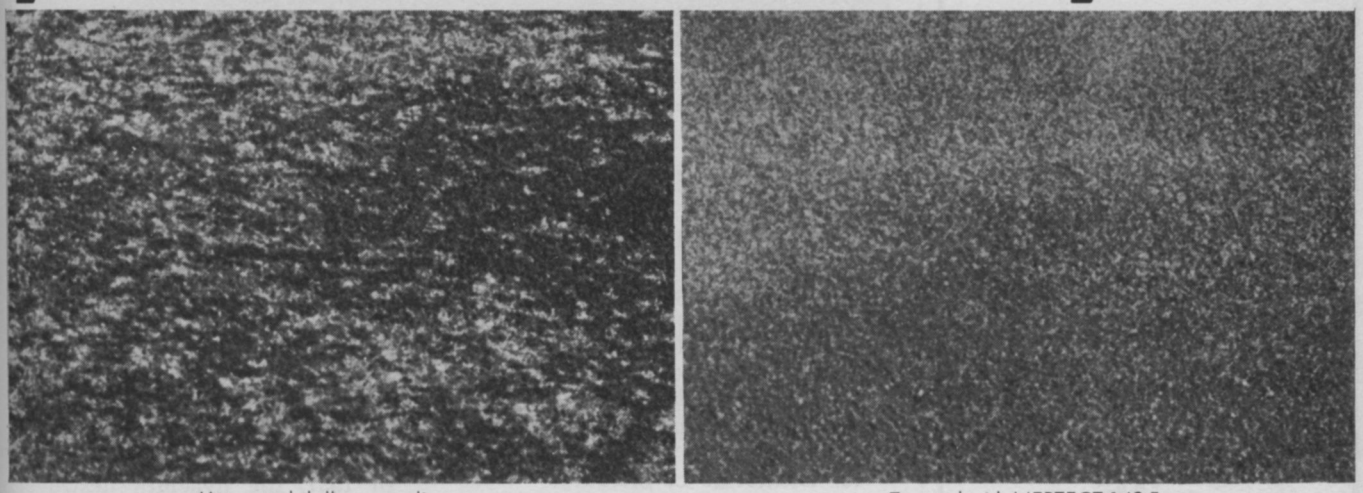
Is the future printing on paper made from water hyacinth beyond the realm of possibility? Can hyacinths be used as a soil amendment and source of plant nutrients? Water hyacinth remove nutrients from the water. Are these nutrients retained during the processing of the plants, and if so, are the plants ac-

(Continued on page 37)



Mechanical control of aquatic plants is presently used in many areas where other means are not feasible.

When dollar spot hits, here's how new systemic MERTECT® 140-F flowable saves your turf, time, and money.



Untreated dollar spot disease

Treated with MERTECT 140-F

These pictures show the kind of dollar spot control you get with new flowable MERTECT 140-F. Even against cadmium-resistant strains. It also works well against brown patch and *Fusarium* patch.

And with its special advantages, MERTECT 140-F makes the performance picture look even better.

Being flowable, it saves you time in measuring and mixing. Handling is safer. Dispersion is more complete, so you get the right mixture for more effective results.

Since MERTECT 140-F is systemic, you also get away with fewer applications per season, thanks to its residual disease control. And it has a lower dosage rate than other fungicides, so you save there, too.

Just follow the label instructions. MERTECT 140-F is not phytotoxic to grasses when used as directed. Your Merck distributor has new flowable MERTECT 140-F now. If you don't have his name, write us. Agricultural Products, Merck Chemical Division, Merck & Co., Inc., Rahway, N.J. 07065.

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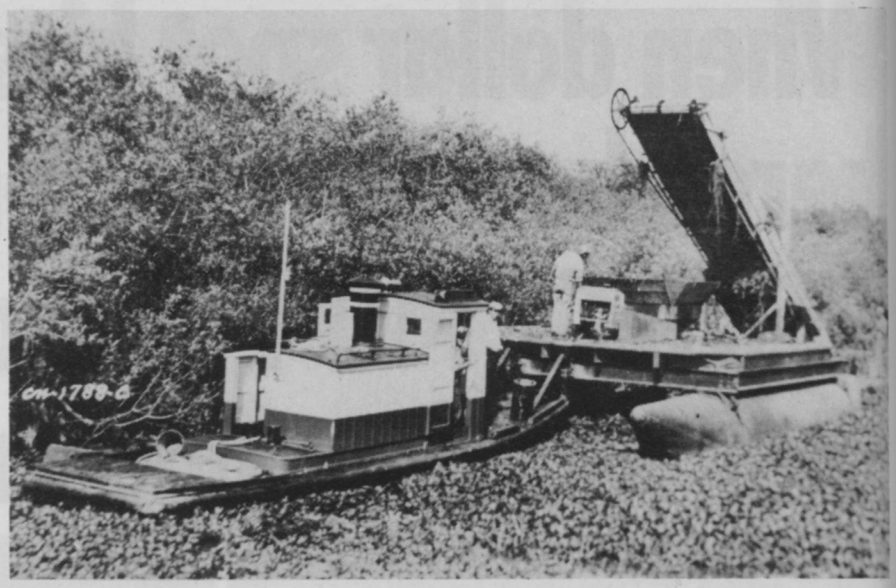


Operating in a sea of hyacinths, this conveyor and dipper are making a trial run in a small canal. Photo was taken in the 1930's.

AQUATIC WEED HISTORY *(from page 12)*

3. Fowler's solution
4. Arsenite of soda
5. Copper sulfate
6. Potassium bichromate
7. Potassium ferrocyanide
8. Crude carbolic acid
9. Potassium hydrate
10. Sulfocarbolic acid
11. Chlorinated lime
12. Bichloride of mercury
13. Monochloride of mercury
14. Lugal's solution of iodine
15. Terpene
16. Oil of tar
17. Tannic acid
18. Aqua regia
19. Kerosene emlusion
20. Whale-oil-soap solution
21. Formaldehyde, 40%
22. Creolin and chloronaphtholeum
23. Sulfurous acid

The first six of these were found to be effective. All of these were also toxic to cattle. Experiments were then conducted to find a repellent which would prevent cattle from eating sprayed plants. Only one effective repellent was found, but the cost was prohibitive.

Sodium arsenite was utilized in Louisiana until 1937. It was abandoned because of cost considerations favoring destruction by machines, defects in effectiveness of the chemical treatment and the demonstrated dangers of this chemical.

Needless to say, the most elementary method of removing hyacinths is to drag or throw them onto the bank. One successful method used was "the elevator", a barge-mounted piece of equipment in which hyacinths are pulled or pushed onto an endless-belt conveyor which lifts them from the water and deposits them on the bank. Barge-mounted equipment with a boom and forked grapple has also been used to deposit the plants on shore. In small canals, draglines with grapples or rakes have also been used.

In 1937, the hyacinth destroyer, "Kenny", a 135 ton, self-propelled, diesel electric, crusher boat was put in operation in the New Orleans District. Vegetation was lifted from the water as the vessel advanced and deposited in a hopper from which it was fed between two rollers operated under 40,000 pounds pressure. The refuse was then returned to the water where it would sink to the bottom. This method resulted in almost complete kill of the plants that passed through it, but its effective use was limited to water deep enough to float the equipment and to areas where hyacinths were massed over a considerable area to feed the machine continuously and in large amounts.

About the same time, the most effective mechanical destroyer in Florida was the "sawboat." This was a specially built boat consisting of three sets or banks of cotton-gin circular saws spaced five-eighths of an inch apart, one bank about six feet in width mounted at the front and one bank on each side about three feet in width. These banks could be raised or lowered. The saws were spun at high speeds and were used to propel the boat. Areas were usually cut about four times to

thoroughly macerate the material.

In Louisiana, barges were utilized to perform the same type operation.

Needless to say, the advent of 2,4-D, with its effectiveness, safety, ease of application, and value for control of water hyacinth and other obnoxious aquatic plants was recognized by the Congress when it authorized a separate Expanded Project for Aquatic Plant Control covering the eight Gulf and South Atlantic States, PL 85-500, 85th Congress, approved July 3, 1958.

That law authorized a comprehensive program to provide for control and progressive eradication of the water hyacinth, alligatorweed and other obnoxious aquatic plant from the navigable waters, tributary streams, connecting channels, and other allied waters in the combined interest of navigation, flood control, drainage, agriculture, fish and wildlife conservation, public health and related purposes including continued research for development of the most effective and economic control measures.

Subsequent amendments, Section 104 of the River and Harbor Act of 1962 and (76 Stat. 1173, 1180) and Section 302 of the River and Harbor Act, Approved 27 October 1965 (79 Stat. 1092) authorized Federal funds for research and extended the program from the Gulf and South Atlantic States to the United States.

In retrospect, the history of obnoxious aquatic plants in the Southeast over thepast 70 years has been related to operation programs of the Corps of Engineers. Much of the research, both chemical and biological, that has been accomplished to date was actually initiated in 1960 under the Expanded Program for Aquatic Plant Control.

Since that time, private industries, State and local agencies have also conducted a large part of the research activities in the field of aquatic plant control.

It is our hope that through the combined efforts of all concerned, the means for control operations can be found that will ultimately lead to the progressive eradication of obnoxious aquatic plants and at the same time provide for the protection of man's environment.

References

1. H. D. No. 27, 85th Congress, 1st Session, "Water Hyacinth Obstructions in the Waters of The Gulf and South Atlantic States," 1958.

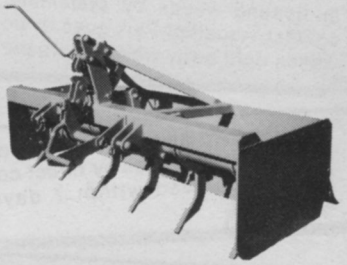
2. Bulletin No. 18, Division of Botany, April 5, 1897, U.S. Department of Agriculture.

3. H. D. No. 251, 89th Congress, 1st Session, "Expanded Project for Aquatic Plant Control," 1965.

These box scrapers mean business!

All ten models are built to move heavy loads quickly with minimum power and effort. Curved blades cut and roll soil into maximum loads. Lifting mechanism and scarifier assemblies are designed with higher front end clearance for larger intakes. The exclusive structural design of all Servis deluxe box scrapers provides direct support from the draw link connection to the rear moldboard to prevent warping or bending. See your dealer for the Servis box scraper that best fits your requirements . . . and make fast, easy work of all future soil moving jobs!

HYDRAULIC models (66", 72", and 84") feature a positive mechanical lock to eliminate any stress on the cylinder, even when scarifiers are cutting the toughest ground.



AUTOMATIC LIFT-TRIP models (66" and 72") feature scarifiers that automatically lift and lock when the box is raised. Trip lever drops teeth back into cutting position.

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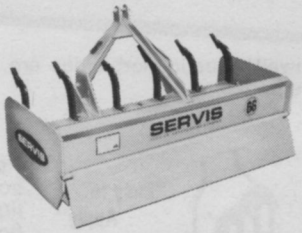

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WATER'S COMPLEX ENVIRONMENT *(from page 14)*

ity for our recreational enjoyment. This requires an intensive research program and orderly system of toxicological screening and evaluation of all chemicals and biological components of the aquatic ecosystem.

Our research activity routinely concentrates on 1) acute and chronic toxicity of all life stages of fish, fish food organisms, and aquatic flora; 2) fate of residues, degradation products, and their biological significance; 3) conditions affecting toxicity, efficacy and persistence, 4) interaction with other chemicals, components of aquatic ecosystem or physical conditions; and 5) alternatives for biological, cultural, or integrated control methods. (See Figure 1, page 40) As the major resource management agency concerned with aquatic habitat improvement, this information generated by research is required for adequate pesticide labeling, recommendations, and guidelines for safe and effective use of chemicals, biological or integrated control systems.

We have repeatedly demonstrated the more persistent organochlorine insecticides are more toxic than organophosphorus insecticides to fish. Our Fish-Pesticide Research Laboratory also finds that fish-food organisms are quite sensitive to many kinds of pesticides. Field studies confirm these data to a reasonable extent when degradation and exposure-contact time are fully appreciated. With this in mind, biologists are understandably alarmed over decisions to use pesticides and pest control programs when the consideration is cost-effectiveness relative to the pest and safety to humans without recognition of toxicity and residue problems threatening fish and wildlife. Biologists as Rachel Carson have been accused of being emotional and unscientific in their attack. Consequently, many studies on the toxicology of pesticides have been challenged or ignored by those responsible for administrative decisions in the use or labeling of pesticides. We welcome the critical examination of these studies, but we also insist on an equally critical examination of proof that the pest control program *will not adversely affect fish and wildlife.*

Also, we insist that where mounting evidence demonstrates many of these pesticides to be undesirable or suspected contaminates of the environment, we should call a halt to their use until proven safe. This applies particularly to those uses in or around aquatic sites since residues have repeatedly shown up in fish and invertebrates. This is most serious for those chemicals that tend to accumulate in high concentrations in fish-food organisms and fish tissues. Biological transfer of pesticide residues, especially in resistant species, from lower food chain organisms up the food chain to fish, also has been well documented. The most resistant individuals that survive are subject to accumulation and transference of pesticide residues to other members of the ecosystem and to man. The resulting chronic toxicity and residues depreciates the productivity of fish and the value of the fishery — these effects are often subtle and unnoticed. More recently, our attention has turned to the organophosphorous and carbamate insecticides and their interaction with organochlorine pesticides and other compounds such as plasticizers like phthalate esters and PCBs (Polychlorinated biphenyls). These chemicals can kill fish outright, result in tissue residues or cause pathology

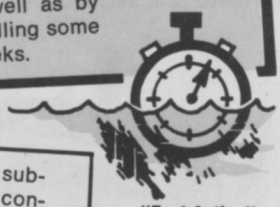
(continued on page 40)

THREE ECONOMICAL WAYS TO CONTROL WATER WEEDS AND/OR ALGAE

Select the aquatic herbicide to meet your needs . . .

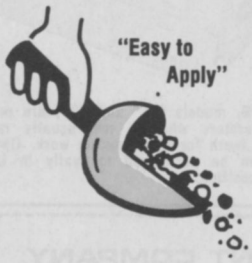
Aquathol-Plus® kills 24 different submerged, emerged, or floating weeds by systematic action as well as by contact. Aquathol-Plus goes to work at once, killing some weeds right away while others die in 2 to 4 weeks.

Aquathol K® kills 15 of the most common submerged water weeds by direct contact. Weed control is achieved within 7 days under normal conditions.



Hydrothol® is a wide-spectrum algaecide—and herbicide — effective against chara and many algae that cause problems in lakes and ponds as well as drainage canals.

Pennwalt Aquatic Herbicides are easy to apply, fast acting, effective and biodegradable.



Pennwalt aquatic-weed and algae control chemicals are available in both liquid and granular formulations. The liquids may be applied direct from the container or diluted with water — either as a surface spray or injected under the water. Granular products can be applied by air, with various types of mechanical spreaders, or broadcast by hand scoop.

Aquatic herbicides are the most effective, economical, and generally, the easiest method for controlling unwanted weeds and algae.

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BEETLE CONTROL DED ANSWER

Reference is made to the article in WEEDS TREES AND TURF — April 1972 entitled "Dutch Elm Disease-One step Closer To A Cure."

Benomyl and other things cited as potential cures or controls for DED fail to recognize the fact that even if Benomyl prevented or over came current infections there is nothing to prohibit the tree from being infected or reinfected.

In spite of current opposition to the use of pesticides there is only one promising approach, in my opinion, and that is to prevent the vector beetles from feeding on healthy trees. In other words emphasis must be placed on beetle control which today is only accomplished by the application of DDT or other long residual insecticides. Applications of DDT by helicopter has shown good to excellent protection, and little if any evidence exists of this causing harm to other forms of life.

Tree sanitation in which weak or broken limbs and trees are removed before beetles bred in them has shown to reduce the beetle population, but this has to be done on an area basis to be effective.

An unexplored area is to radiate and sexually sterilize the beetles. This might then be used as in the case of the screw worm to control the beetle and at the same time the disease. **William D. Buchanan — Entomologist, Brigham Young University, Provo, Utah.**

ACUPUNCTURE HURTS

Little items like the one on page 64 of the May, 1972 issue of WEEDS TREES AND TURF on "Acupuncture for Dying Elms" can do nothing but set plant pathology back at least 20 years. **Lester P. Nichols, Professor Plant Pathology Extension, Penn State University**

SET RECORD STRAIGHT

I was interested to read the article in your May, 1972 issue entitled "Ultra Violet Light Helps De-code Ryegrass Species". The article is timely and most points are well taken. However, I would like to make specific objection to the portion in the article by Dr. Henry W. Indyk concerning the Canadian variety Norlea Perennial Ryegrass.

Dr. Indyk mentions dissatisfaction with the turf performance of Norlea due to a contamination of the seed with inferior Ryegrasses.

The performance of any variety can be severely compromised if the seed contains ad-mixtures of any other crop or weed species, but this condition should not reflect on the usefulness of the variety but rather on the seed grower who produced the seed and the production area.

Oseco Limited is the largest distributor and exporter of Norlea Perennial Ryegrass. Our production fields are carefully controlled to ensure no contamination of inferior Ryegrasses as evidenced by analysis tests on all our 1971 crop which showed 0.0% fluorescence.

Dr. Indyk's comments reflect poorly on the usefulness of the Norlea variety and we would be grateful if you would set the record straight. **G. Eros, general manager, OSECO LIMITED.**

REBUTTAL

Mr. Eros' . . . statements made in reference to Norlea ryegrass in my portion of the article are understandable. The statements made are fact and were used as a classical example to illustrate what can happen with a good variety that has taken a great deal of effort to develop. The intent was not to condemn the performance of the variety. He fails to mention that a statement was made relative to its proven performance. Also, perhaps unknown to him, New Jersey was among the first in the United States to recognize the superiority of Norlea to other ryegrasses available at that time and on this basis, it was included in our recommendations. . . . **Henry W. Indyk, Specialist in Turfgrass Management, Rutgers University.**

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AQUATIC HERBICIDES — NEW POSSIBILITIES

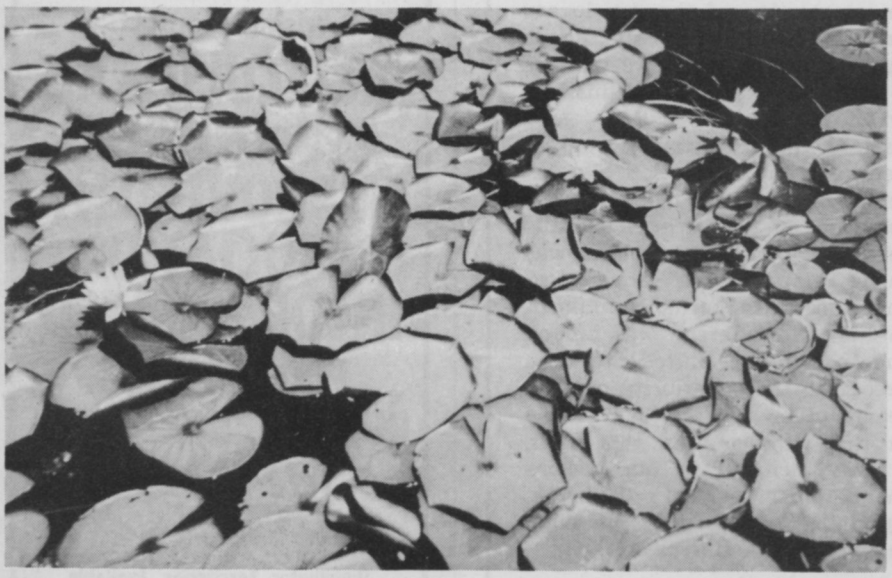
By DR. ROBERT C. HILTIBRAN
Associate Professor of Agronomy
University of Illinois

SINCE about 1967 the development of aquatic herbicides has been considerably curtailed. This has been due in part to the collection of data which indicates that some pesticides, primarily the organo-chloro insecticides, have been accumulating in various segments of the environment and have been producing various undesirable effects.

Further, a recent report indicates that 2,4,5-T formulations when fed to rats at high rates cause teratogenic effects. A general awareness has developed that the chemical age is introducing agents into the environment that are detrimental to the environment. Since these reports implicate pesticides, the registration of many aquatic herbicides have been reevaluated.

Furthermore, additional research efforts are required which increased the cost of development of aquatic herbicides. Aquatic herbicides have a rather limited monetary return and the increased costs have resulted in reduced developmental work on new aquatic herbicides. In fact, additional data is now required to support the continued use of aquatic herbicides.

At this point, there is little evidence which indicates that aquatic herbicides have been detrimental to the aquatic environment or that residues have been accumulating, except for arsenic and copper. However, sodium arsenite and copper sulfate have been widely used for the control of submersed aquatic plants and algae, respectively. Since arsenic and copper are metals, only the chemical composition of these metals can change and these will accumulate within the aquatic system. To date, there has not been any indication that in ponds and lakes the bottom soil accumulations of arsenic and copper have been detrimental. There are reports that copper has decreased fish production.



Waterlilies have covered this area and prevented efficient flow of water.

Aquatic heribicides containing arsenic or copper should not be classed with the organic-type aquatic herbicides such as endothall, diquat or 2,4-D, since the latter apparently undergo decomposition to various products which may be metabolized further and become part of the carbon component within the aquatic system. It should be pointed out that while 2,4-D and silvex are organo-chloro herbicides there is indication that these compounds are being degraded and they have not accumulated in any segment of the aquatic environment.

In several recent studies at the Natural History Survey it was found that the butyl ester of 2,4-D, which is toxic to fish, did not appear to have any direct toxicity to several bethnic organisms and the 2,4-D was rapidly removed from the water. Usually some ester or salt derivative of 2,4-D is used in the herbicide formulations. The esters of 2,4-D are more toxic to fish than salts.

In our laboratory we observed that 2,4-D and 2,4,5-T (acid) were not readily absorbed by bluegills. It has been shown that the butoxy ethanol ester of 2,4-D was more readily absorbed from water than the 2,4-D acid; however, the esters of 2,4-D and silvex were rapidly hydrolyzed within the aquatic environment. This indicates that fish exposed to an application of an aquatic herbicide containing 2,4-D or silvex would not accumulate much 2,4-D or silvex since the exposure of the fish to the esters would be very short; even with a longer period of exposure to the acid, little would be absorbed by fish.

This further suggests that any contamination of an aquatic environment with a herbicide containing 2,4-D, 2,4,5-T or silvex would not present a great potential for hazard, since the esters would be rapidly hydrolyzed and fish would be exposed longer to the acid form. This does not mean that trouble could not develop, when extreme excesses of phenoxy herbicides entered the aquatic environment. But potential danger would be minimized.

The Natural History Survey continues to investigate the effects of available aquatic herbicides and to attempt to develop techniques for the control of aquatic plant species

which have been difficult to control.

One such species is spatterdock, *Nuphar advena,* a member of the waterlily family. Spatterdock is quite common in the southern part of Illinois. It had been reported to be controlled by the use of granular 2,4-D. However, I was advised that spatterdock was not being controlled with 2,4-D. Thus, we investigated the effect of 2,4-D, 2,4,5-T and silvex on spatterdock over a two year period and although a severe reduction in the stand occurred, the plants were not eliminated from the treated areas.

During the summer of 1968, we learned that a post emergent application of dichlobenil (Casoron) was effective against spatterdock. In late summer we applied dichlobenil against spatterdock and the plants were severely damaged. Unfortunately we could not continue these observations the following spring nor make early spring applications of Casoron on spatterdock.

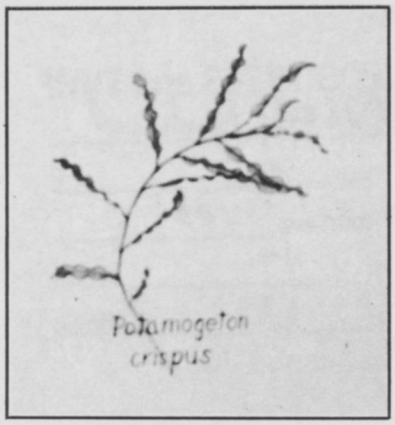
Recently it was reported that postemergence applications of dichlobenil on waterlilies at rates of 5 lb ai/A applied during periods of active growth in June and July gave excellent results, and that spatterdock was controlled with applications of 8-10 lb ai/A. Since dichlobenil has been registered for preemergence use only, the Thompson-Hayward Company is seeking a change in the registration to include these postemergent uses of dichlobenil for spatterdock and waterlily.

Spatterdock, also known as yellow waterlily or cowlily, has a broadly notched leaf a little longer than wide. The lobes are somewhat pointed, spreading from a 45 to 80° angle. The petiole, or leaf stalk, holds the leaves nearly erect. However, the leaves may float on the water surfice. It has a yellow flower and a somewhat globular fleshy fruit containing many seeds. Spatterdock has an underground thick, spongy root stock or stem which has to be killed for control of plants.

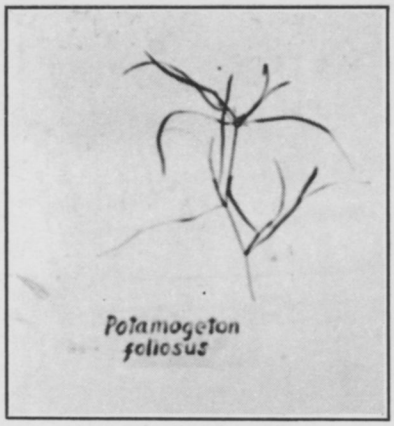
Another species which had not responded to suggested rates of herbicide applications was water stargrass, *Heteranthera dubia.* Water stargrass, also called mud plantain, has ribbon-like leaves and the stems and leaves are long and flexible and trail through the water. Water stargrass closely resembles a submersed *Potamogeton* spp. but can readily be distinguished from them by the lack of a definitive mid-vein in the leaves, and, in the late summer, by the characteristic yellow star-like flower.

(continued on page 30)

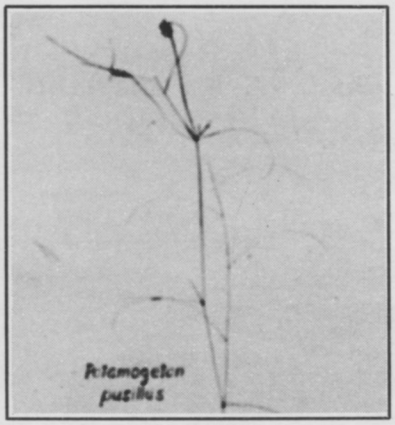
COMMON AQUATIC WEEDS



Curlyleaf Pondweed

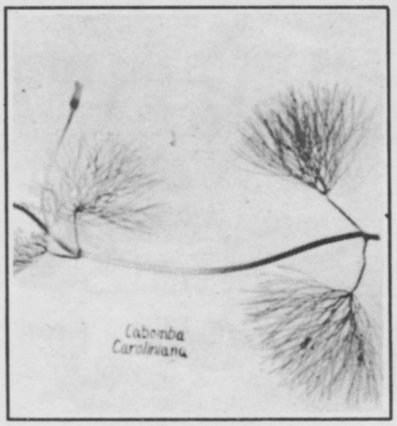


Leafy Pondweed

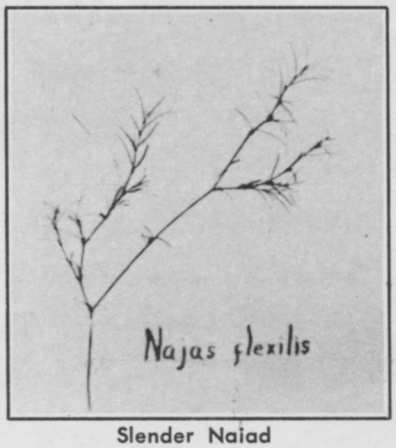


Small Pondweed

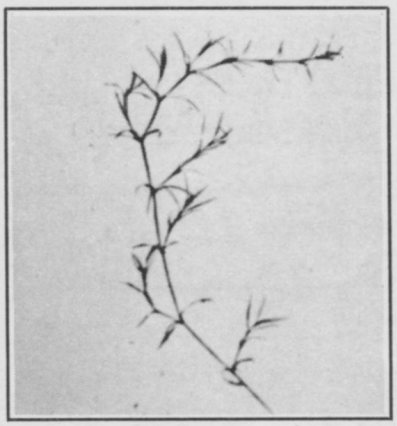
Waterstar grass



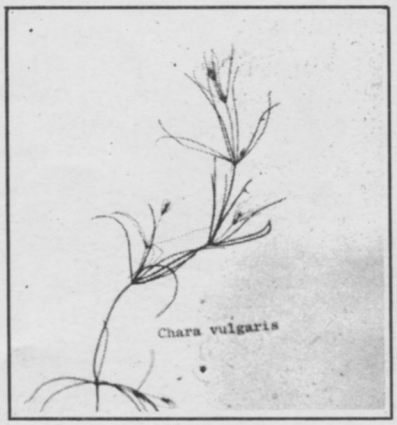
Cabomba



Slender Naiad



Southern Naiad



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ILLINOIS RESEARCH *(from page 27)*

Sodium endothall was reported to have controlled water stargrass at rates of 2 to 3 ppm. Data from southern Illinois indicated that water stargrass was not being controlled by sodium endothall at high rates. We found that diquat cation (Diquat) at 1 ppm and potassium endothall (Herbicide 273) at rates of 5 ppm eliminated water stargrass from the treated areas. *Note — We did not apply sodium endothall against water stargrass for comparison. Hence, the potassium salt of endothall must be used for water stargrass control.)*

Some of our early investigations on the control of cabomba, *Cabomba caroliniana* using granular 2,4-D or silvex were not successful. Later investigations indicated that cabomba was eliminated from the test areas using the granular isooctyl ester of 2(2,4-dichlorophenoxy) propionic acid. However, 12 weeks were required before the cabomba plants were eliminated.

We have continued our interest in the control of cabomba and reinvestigated the effects of granular 2,4-D and silvex on cabomba. While we have not obtained real definitive data, our results suggest that granular 2,4-D and silvex suppress or retard the development of cabomba during the growing season. Cabomba develops late in the growing season

(continued on page 32)

Table 1. Various aquatic weeds controlled with aquatic herbicides in tests conducted by the Illinois Natural History Survey.

Group and Species	Chemical, active ingredient or free acid equivalent	Experimental or Tested Rate of application	Remarks
EMERGENT			
Spatterdock *Nuphar advena*	dichlobenil	6 lb ai/A 3 lb-4% Granules* per 440 ft²	Spread on the water surface
Waterlilies *Nymphaea* spp.	dichlobenil	5 lb/ai/A	Spread on the water surface
SUBMERSED PLANTS WITH ALTERNATE LEAF ATTACHMENT			
Curlyleaf Pondweed	Hydrothol-47 (L) (di-N,N,-dimethylcocoamine salt of endothall)	0.5 ppm (endothall content)	Apply on or below the water surface
Potamogeton crispus	diquat copper-triethanolamine complex	0.25 ppm diquat equal volume of copper-triethanolamine complex	Apply or or below the water surface
	Hydrothol-47 (10% G)	100 lb/A	Spread on the water surface
Leafy Pondweed *P. folious*	Hydrothol-47 (10% G)	100 lb/A	Spread on the water surface
Small Pondweed *P. pusillus*	Same as for leafy pondweed	100 lb/A	Spread on the water surface
Waterstar grass	diquat cation	1 ppm or 2 gal/ surface A	Apply on or below water surface
(Heteranthera dubia)	endothall potassium salt (4 lb/gal or 10% G)	5 ppm	Apply on or below water surface
SUBMERSED PLANTS WITH WHORIED OR OPPOSITE LEAF ATTACHMENT			
Cabomba *Cabomba caroliniana*	2,4-D ester (20% G)	2-3 lb/440 ft² 200-300 lb/ surface A	Apply on or below water surface
Slender Naiad *Najas flexilis*	Hydrothol-47 (L)	2 ppm (endothall content)	Apply on or below the water
Southern naiad *N. quadalupensis*	Hydrothol-47 (L)	2 ppm (endothall content)	Apply on or below the water surface
ALGAE THAT RESEMBLE TRUE PLANTS			
Chara *(Chara* spp)	Hydrothol-47 (10% G) copper-triethanolamine complex	100 lb/surface A 0.5-1 ppm	Spread on the water surface
ALGAE			
Filamentous	Hydrothol-47 (10% G) copper-triethanolamine complex	100 lb/surface A 0.5-1 ppm (copper content)	Spread on the water surface

*The formulation currently available may contain 10% dichlobenil.

—industry people on the move—

DOUG ROBSON and **PAUL GREENWALT,** appointed district sales manager for southeast and northwest area, respectively, for Wayne Manufacturing Co., Pomona, Calif.

* * *

RODGER L. CLARK, joined Bolens Div., FMC Corp, as district sales manager for southeastern U.S. Was formerly with Jack Dayton & Son, Springfield, Ohio.

* * *

ROBERT A. LEFFEL, appointed area manager for the eastern U. S. for Kohler Co. He suceeds **DOUGLAS G. S. COOK** who has been assigned to new O.E.M. sales responsibilities at the home office in Wisc.

* * *

IRV TERRY, former president of Wilkins Regulator Co., a division of Zurn Industries, Inc., assumes expanded duties as a Zurn vice president. Will coordinate various sales programs among Zurn divisions engaged in marketing water supply and wastewater controls.

* * *

KENNETH R. WEISHAUPT, becomes technical specialist at Niagara Chemical Division of FMC Corp. for Pyrenone products, a synergized pyrethrum insecticide.

* * *

PATRICIA ANN WEIS, appointed area consultant for the National Golf Foundation. She is currently associate professor in the department of physical instructions at the University of Texas at Austin.

* * *

BILL J. WARREN, named southwest regional sales manager for the Weather-matic division of Telsco Industries.

* * *

JAMES M. JENNISON, elected vice president of The Leisure Group, Inc. He will continue as general manager of lawn and garden products which include sprinkling and irrigation systems, spray guns and indoor plant care products.

* * *

BILL TAVENER, GARY McELVANEY, JERRY GOULD are new ProTurf technical representatives of O. M. Scotts & Sons' nationwide program for servicing golf courses and other large turfgrass areas.

* * *

HAROLD E. W. PROST, named manager of materials for the Allis-Chalmers Corp. outdoor and leisure products, **LARRY L. KUBIK,** named manager of merchandising for this product line.

* * *

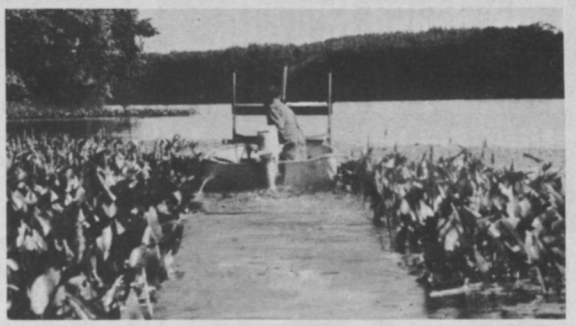
WILLIAM A. MEYER, appointed to the newly created position of director or research for Warren's Turf Nursery. He will direct the development of new strains of grasses now under study.

* * *

GEORGE A. LAWRENCE and **MARTIN C. HEISELE,** promoted to marketing and sales manager for domestic and international sales and operations manager of the agricultural chemicals division, respectively, for Diamond Shamrock Chemical Co.

* * *

JOHN C. NORTON named group vice president of The Toro Company. He will oversee the distributing division which includes company owned distributorships in southern California, metropolitan New York, Chicago and Atlanta.



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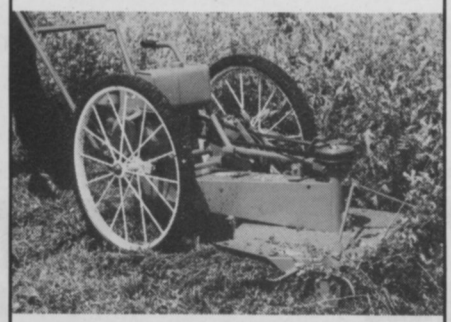
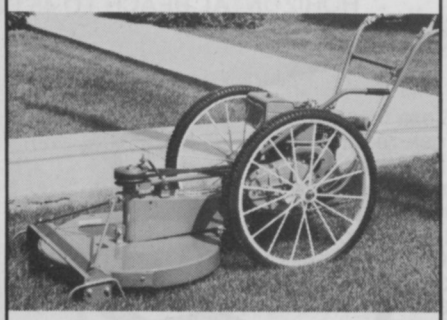


By tipping front of blade downward (crank furnished), trailing end of blade tips upward over cut debris. Blade housing won't clog, growth is cut clean, not trampled.



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ILLINOIS RESEARCH *(from page 30)*

and blooms in central Illinois in late July or early August. An extensive stand may not be visible in the water in June, which makes the evaluation of the effects difficult, and the 12 weeks covers most of the growing season.

Rechecking data of previous experiments indicated a supression or retardation of the growth of cabomba apparently has occurred. Thus, if the control of cabomba is desired, an application of 200 to 300 lb of granular 2,4-D per surface acre, of a formulation containing 20 lb of 2,4-D acid per 100 lb, may supress the growth of cabomba.

Some aquatic plant control investigators observed that a diquat-copper sulfate combination was useful when neither herbicide alone was effective. They tested the diquat-copper sulfate combination on aquatic plants susceptible to diquat and found that the diquat-copper complex was very effective and that lower rates of diquat could be used.

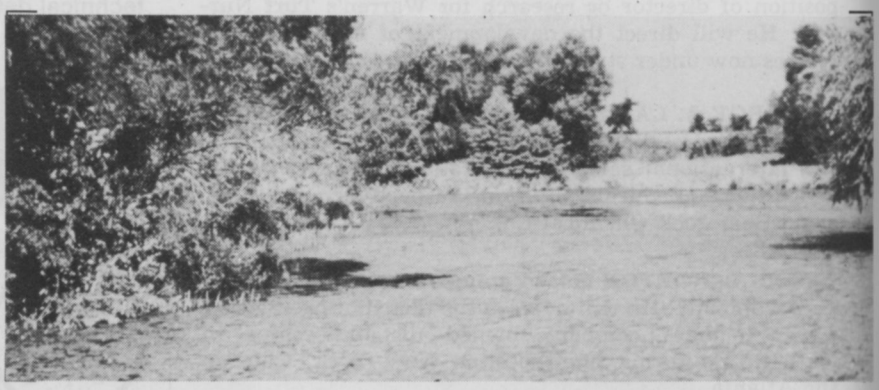
The volume of the diquat-copper sulfate mixture was determined by first estimating the necessary amount of diquat to treat a given area of *Potamogeton* spp. at the rate of 0.5 ppm, then taking ½ the necessary amount of diquat and mixing it with an equal volume of Cutrine (a copper sulfate triethanolamine formulation distributed by Applied Biochemists, Inc., Mequon, Wisconsin) finally diluting the complex with water and applying it under the water in the usual manner.

We were able to eliminate curly-leaf pondweed *P. crispus* at a rate of 0.25 ppm of diquat. We have not tested this diquat-copper complex widely against the more-difficult-to-control aquatic plants such as American elodea, *Elodea canadensis,* southern naiad, *Najas quadalupensis,* slender naiad, *N. flexilis,* bushy pondweed, *N. gracillima* or coontail, *Ceratophyllum demersum.* For the control of these plants, a rate of 1 ppm of diquat cation (Diquat) is required.

Hydrothol-47 a product of the Penwalt Corporation has been recommended as an aquatic herbicide, primarily as an algaecide. Hydrothol-47 is toxic to fish and has had very limited use for the control of submersed aquatic plants. Recently in southern Indiana, 100 lb of granular Hydrothol-47 per surface acre of water with a minimum average depth of 4 feet and maximum average depth of 6 feet, gave very good control of several potamogetons. No loss of fish was reported.

During 1971 we applied 100 lb of granular Hydrothol-47 to a one acre pond containing a mixed stand of potamogetons, a relatively heavy stand of filamentous algae and some chara, *Chara vulgaris.* Leafy pondweed, *P. foliosus* was severely damaged in 3 days and small pondweed, *P. pusillus* was eliminted in 5 days. Four days after application heavy rains caused an influx of water, resulting in a one-foot increase in water depth. Sago pondweed, *P. pectinatus,* was not damaged and the stand of filamentous algae was reduced. There was not sufficient chara to obtain an adequate evaluation of the effect of this rate of application of Hydrothol-47 against it. *(Note—I have been advised that in southern Indiana experiments, stands of sago pondweed, chara and filamentous algae were eliminated by this rate of application of Hydrothol-47.)*

In previous experiments we had found that liquid Hydrothol-47 was effective against southern naiad, and chara, but at rates of 2 ppm endothall content. Should Hydrothol-47 be effective against the **Najas** spp and chara, it should give an additional aquatic herbicide for use in the control of these very abundant aquatic plants.



Filamentous algae covering a pond used for irrigation.

Copper Sulfate Not Harmful To Fish, Study Shows

Reports on the fate of nearly one and one-half million pounds of copper sulfate to control algae over the past 50 years fail to show any concentrations toxic to fish.

This is the conclusion of G. Fred Lee and Isaac Sanchez of the University of Wisconsin's department of civil and environmental engineering. The study concerned sampling water of Lake Monona at Madison, Wisc.

According to the researchers, the concentrations found in Lake Monona water are considerably less than the most stringent copper standards proposed by Federal or state regulatory agencies for protection of water quality.

The ban on the use of chemicals in the Madison lakes, passed last year, was made primarily on "emotional considerations," Lee said, "rather than technical evidence that copper sulfate was harmful to the lake's fisheries."

He said that in lakes such as Monona the nutrient supply is primarily from street runoff and other sources which are now almost impossible to control. In these situations, use of chemicals such as copper sulfate provides a method of improving water quality at very little risk to the ecosystem.

Lee suggests that a proper policy would be to have a qualified board of experts review any proposed chemical additions to Madison lakes to prevent excessive or improper use of chemicals for water quality control. He urged that as a part of any chemical use program for control of algae, weeds, or undesirable fish, more studies be done on the subtle effects of chemicals on organisms other than those the chemicals are designed to control.

Rapid Algal Growth Promoted by Herbicides

Growth of Algae is enhanced when herbicides are used to control weeds in lakes, says a University of Wisconsin researcher.

G. V. Simsiman, research assistant, reports that after herbicidal treatment, nutrients released by dead weeds promoted rapid algal growth.

Simsiman said he did not feel the use of herbicides should be discontinued as they are the most effective weed control means available today. He advocated, however, additional research into use and effects of herbicides and their possible substitutes.

The researcher is currently studying how long herbicides remain in a water system after application.

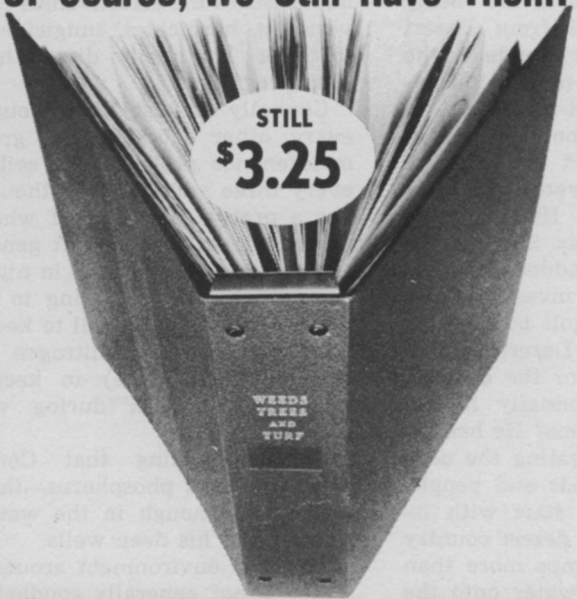
Connecticut Entomologist Ends 43 Year Career

John C. Schread, one of the most widely known entomologists in the northeast, has retired after nearly 43 years on the staff of The Connecticut Agricultural Experiment Station.

He is widely known for his work with nurserymen, greenskeepers, and other professionals in the field of entomology. He has addressed turf association meetings in California, Philadelphia, Washington, Montreal and throughout the northeast.

He is an honorary member of the Connecticut Association of Golf Course Superintendents Association of America.

Of Course, We Still Have Them!



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LAS VEGAS *(from page 18)*

isn't much rainfall in southern Nevada. An inch or two a year is about normal, and that usually comes all at once. It is a longer shot than getting the jackpot in the casinos. "It is a great germinating ground for crabgrass, goosegrass, and any other kind of weeds that like dry weather and heavy traffic on the course," observes Connally. It all adds up to a challenge for golfers, grass and the superintendent.

But the odds against Jim Connally do not end here. Desert Inn is host to a variety of tournaments. Biggest of them all, as a superintendent sees it, are the nationally known Gold Cup Tournaments. Groups from golf clubs all over the country come to match their swings against each other. These tournaments run every week from September to June. There is a big final playoff at the end of June. The prize for the winning club is a $50,000 gold cup which travels from club to club. Individual winners get a smaller gold cup—worth about $1,400 — which they can keep. During this nine month period the traffic on the course often exceeds 250 a day.

Between Gold Cup competitions, the Desert Inn course plays host to major professional competition. The Tournament of Champions has been played there. In 1971 the Sealy LPGA was televised from Desert Inn. Every golf superintendent who has ever hosted a major tournament knows what that involves.

Just one more complication at Desert Inn is the fact that the Inn and the golf course were one of the early purchases of Hughes Tool Company in Las Vegas. Some of the hotels and casinos added later to the Howard Hughes investments in Las Vegas have no golf courses. So the guests come to Desert Inn. It means more traffic for the course.

How does Jim Connally handle these multiple problems? He has become an expert in beating the odds against weather, weeds and people.

For example, let's start with irrigation. In the high desert country of Las Vegas, he pumps more than a million gallons of water onto the course every 24 hours during the hot months of July and August. He applies up to 200,000 gallons a day during the rest of the year. The water comes from three 1,100-foot wells on the course. It is pumped into the small lakes and ponds which provide the course's water hazards. From there, it is pumped to the fairways and greens, mostly at night, by an automatic electric-powered underground system.

The best grass Connally has found to beat Nevada's weather extremes on the fairways is common Bermuda. He over-seeds each fall with a ryegrass variety. His greens are sowed with Penncross Bent.

Weed control is a major problem. The dry climate and the heavy player traffic on the course provide ideal germinating and growing conditions for a variety of noxious weeds. Crabgrass and goosegrass are the worst. Years ago, Connally started using Dacthal, a broad-spectrum herbicide. It has worked for him.

He spreads Dacthal G-5, a five percent granular formulation, twice a year — in January and in March — at rates varying from 160 to 180 pounds per acre. Using a Larson broadcaster with a 30 foot throw, he travels about 8 mph and manages to keep about one hole ahead of a foursome. He likes the granular form because it stays close to the surface where the weeds germinate in the high desert soil. In addition, the granular product doesn't leach, even during periods of heavy irrigation.

However, Connally is not the kind of a customer that a careless salesman can count on. There is a corner of the Desert Inn course where he maintains a special test plot. Here, he measures the effectiveness of turf varieties, herbicides, fungicides and fertilizer. The results dictate his future programs.

Connally is just as thorough in every other facet of his grounds maintenance program. He soil tests every three months, even though he has a pretty good idea of what his desert soil will require. It generally calls for a fertilizer high in nitrogen and potash—in the spring to make the turf grow, in the fall to keep the color. He counts on nitrogen (urea and calcium nitrate) to keep the fairways green during winter periods.

The one thing that Connally doesn't need is phosphorus—there is more than enough in the water he draws from his deep wells.

The arid environment around Las Vegas is not generally conducive to turf diseases. But on those rare occasions when the humidity is high, he applies Daconil 2787, a broad spectrum fungicide that has activity against many major turf diseases.

Connally doesn't have much time for tillage. The year-round playing season and the daily crowds on the course make it next to impossible. However, he does aerate the fairways and remove thatch. Addition-

ally, he schedules 4-5 aerations of the greens each year.

Desert Inn presents still another problem which doesn't exactly involve the playing areas. It is trees. Southern Nevada is not a big forest area, but the Club boasts some of the oldest trees in the state. The olive trees are estimated to be up to 100 years old. There are also elms, cottonwoods, Arizona cypress and ash, and weeping willows. Connally maintains them with the same thoroughness that he attends to the greens and fairways. They are hydrospaded with liquid fertilizer each spring and fall. Once a year, professional tree surgeons come to prune and trim the trees. They add to the beauty—and hazards—of the course.

Connally's 20-man maintenance crew work round the clock. Mowing is done at dawn. Aerifying, watering, topdressing are accomplished while the guests are asleep, or at the gaming tables. After all, Las Vegas is a 24-hour town. Only the golfers wait until daylight. So the work on the course has to be done when course traffic is light.

Despite his year-around battle with the climate and the crowds, Jim Connally maintains a keen sense of humor about the things that go on around him.

One of his favorite stories involves a player who walked into the maintenance yard and asked for a ladder. "Why a ladder?" asked Connally.

"I blew a shot on the 17th fairway, right under that big cottonwood tree" said the golfer. "I got so mad I threw the club up in the air. It stuck in a branch. I threw one, and then another club up to get the first one back, and they stuck. I'd leave the clubs and give up this game . . . except that clubs are rented. I have to get them back to the pro shop."

Connally found a ladder.

One time, owner Howard Hughes stopped by the Desert Inn just before a major tournament. Several television relay towers had been erected. "What are those?" demanded Mr. Hughes. Their purpose was explained. "Take them down. They spoil the beauty of the course," was the order. It took fast teamwork to remove the towers and lay ground cables overnight to get the game on the air.

It is all in a day's work for Jim Connally. And while others gamble fortunes, he invests in sound maintenance programs that pay off handsomely in quality turf at Desert Inn. For Connally has found that even in Las Vegas, you can't gamble with turf.

Protective Clothing Safety Conference Topic

One hundred and thirty authorities from government, industry, and science recently met on progress and problems related to providing adequate protective clothing and equipment for workers using pesticides.

The conference, sponsored by the Federal Working Group on Pest Management, was held at the Center for Disease Control in Atlanta. Its purpose as stated by Dr. Fred H. Tschirley, chairman of the Working Group, was to assess the current success of clothing and equipment in providing protection; technological progress to date; government regulations affecting clothing and equipment; and the acceptance and use of protective devices by pesticide applicators.

Among the goals of the conference were the identification of deficiencies in the practical use of protective equipment and the development of guidelines for the more effective use of protective clothing.

Many authorities presented papers at the conference. Dr. John Davies, Department of Medicine, University of Miami, Florida, said, "It is a must that we study men in the lab as well as the food they eat as we increase our knowledge of pesticides in relation to the environment."

Dr. Howard Maibach, department of dermatology, University of California Medical School, presented results of recent research. The amount of absorption of pesticides through the human skin, he found, varies with the location on the body. The forehead absorbs seven times as much pesticide as the forearm and the scalp four times as much as the forearm and palm. Washing, he noted, is most effective within one minute of exposure but only somewhat effective within a half hour of exposure, indicating the urgent need for immediate attention following skin exposure to pesticides.

Robert Merkle, a product line manager with an equipment manufacturing company, listed the three avenues of entry of pesticides as mouth, nose and skin. He cautioned that respirators should fit individuals perfectly to be effective, that tight facial seal was essential, and that respirators should be protected from contamination inside the mask at all times.

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Plant Expansion And Backhoe Announced By Ford

The Ford Motor Company has broken ground for a more than ten-fold expansion of its Rome, Mich. tractor and equipment plant. The plant will be expanded from its present 100,000 square feet to nearly 1.2 million square feet and provide Ford with a single base for building farm and industrial tractors for the North American market.

The expansion program calls for consolidation at Romeo of manufacturing and assembly of Ford tractors now being done in the Des Moines, Iowa, and Highland Park, Romeo and Royal Oak, Mich., plants. Ford plans to erect the first steel by October and move in the first manufacturing operations from other locations by next May.

Coupled with this announcement is the introduction of a new truck-mounted backhoe (TMB). It is the first unit of its type with all components completely engineered, tested and assembled by a single manufacturer.

"Placing a Ford backhoe on a Ford F-600 series truck represents a natural marriage between time-proven leaders in their separate fields," said Robert C. Leary, general operations manager, Ford tractor and implement operations — North America.

Ford's exclusive "Auto-Dig" backhoe system which assures a full bucket every time can be teamed with the TMB.

Introduction of a new truck mounted backhoe at the Romeo tractor and equipment plant calls for a celebration. Here, Arthur V. Edwards, publisher, WEEDS TREES and TURF, holds his glass while Glenn Long of Ford's industrial sales department staff pours the champagne from a bottle which is attached to the bucket of the backhoe. Standing on the right is Robert C. Leary, general operations manager, Ford tractor and implement operations — North America.

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AQUATIC PLANT RESEARCH *(from page 20)*

ceptable in the diets of meat-producing animals? We hope to answer these and other questions through research efforts.

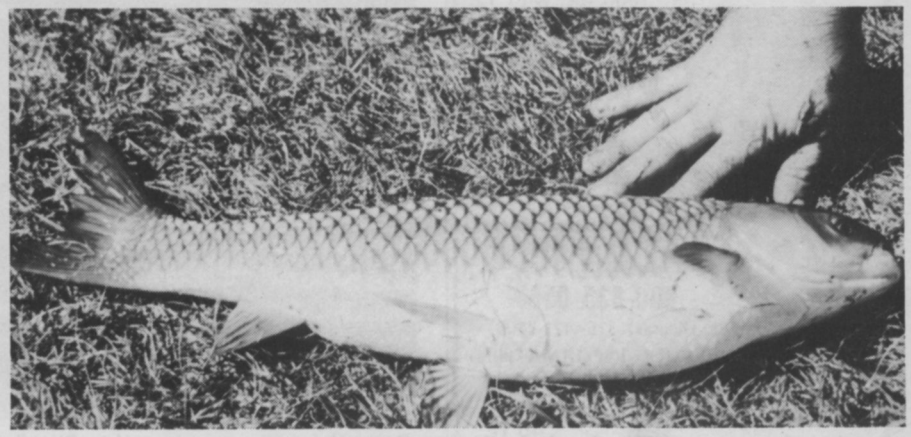
The chemical control efforts have been primarily in the area of techniques of application; particularly treatment of submersed aquatics (especially hydrilla). Evaluation of the physiological aspects of herbicides applied through the bivert is underway. In addition, we see possibilities of using growth retardants or perhaps altering the ecological factors to limit the growth of hydrilla. The use of growth retardants, their desired concentration and the effect of these regulators on water quality and other desirable organisms is under study.

In addition, some "novel" chemical techniques are being evaluated. These techniques include the possible use of ion exchange agents to deprive hydrilla of certain elements needed for growth. Can we alter basic soil or water factors needed for the growth of hydrilla? Again, these are questions we hope to answer through our research efforts. Those agencies and/or institutions presently conducting research include the U. S. Department of Agriculture, University of Florida, University of South Florida, and Florida Technological University.

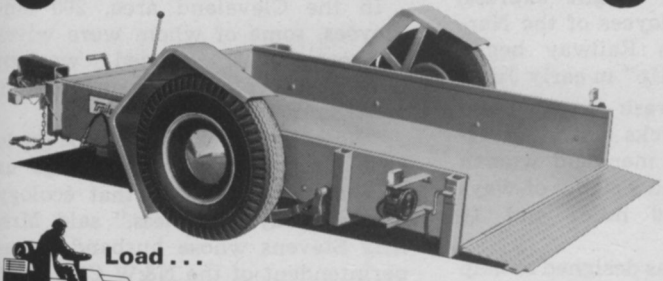
Secondly, funds are allocated to aid local aquatic control programs. Any public, city, county or district agency which has an approved aquatic plant control program and meets criteria established by the Department of Natural Resources is subject to participation in matching funds. These criteria are outlined in the "Guidelines for Aquatic Weed Control" available through the Bureau.

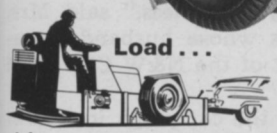
Lastly, the Bureau serves an informational function in control programs. Personnel work with the above local agencies in establishing new control programs and educating personnel in new products and techniques of applications. The number of state control crews working in the Florida Game and Fresh Water Fish Comm. has doubled. In addition, four Regional Botanists have been employed to work specifically in aquatic plant control.

The white amur, a herbivorous fish, is promising as a biological control for aquatic plants.



One Manhandling





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Dressed for the occasion, Mrs. Rita Stevens of Cleveland patrols N&W tracks and rights-of-way for refuse. She was one of nearly 27,000 persons who participated in "Operation Clean Up."

Railway Cleanup Campaign Nets Tons of Refuse

With the energy of a diesel locomotive pulling a freight express, nearly 27,000 employees of the Norfolk and Western Railway began "Operation Clean Up" in early June.

Armed with trash bags, paint brushes, rakes, trucks and other assorted equipment, men and women cleaned the railroad's rights-of-ways which cover 8,000 miles and 14 states.

The campaign was designed to help improve the ecology by removing refuse, particularly in areas where N&W tracks went through cities and residential areas. One official pointed out that as far as could be determined, the N&W was the first railroad to undertake such a program — certainly one on such a massive scale. Excellent cooperation was received from railroad management, various railroad crafts and from labor organizations.

"It is a joint effort of labor and management to improve the appearance of our railroad," said John P. Fishwick, N&W president and chief executive officer. "We believe that a united, cooperative effort by all employees can change the face of the company, especially those yards and areas that are visible to the public."

In the Cleveland area, 200 employees, some of whom were wives of employees, policed western Greater Cleveland and surrounding suburbs.

"We believe that this campaign to clean the rights-of-ways brings us to a closer realization that ecology is everybody's business," said Mrs. Rita Stevens whose husband is superintendent of the N&W Cleveland Terminal.

Results of the campaign in Cleveland totaled more than 130 tons of debris. Five railroad gondola cars were needed to remove the refuse to the disposal area.

The significance of the June 1 campaign was noted by railroad historians. In 1886 N&W employees changed the guage of the railroad from Bristol, Va. to Norfolk, Va.—a distance of 408 miles—in one day. On that date all train traffic was halted for the day to give crews absolute freedom to accomplish the job. This year the trains operated as usual.

—meeting dates—

Ohio Chapter, International Shade Tree Conference, summer meeting, Secor Park, Metropolitan Park District, Toledo, Ohio, July 12.

American Association of Nurserymen, Statler Hilton, Washington, D.C., July 16-19.

Society for Economic Botany, 13th annual, University of Mississippi campus, University, Miss., July 30-Aug. 2.

National Golf Foundation Eastern Seminar, Pine Needles Country Club, Southern Pines, N.C., Aug. 7-11.

Rutgers Turfgrass Research Day, College of Agriculture, College Farm Road and Dudley Road, New Brunswick, N.J. August 10.

International Shade Tree Conference, Inc., 48th annual, Newporter Inn, Newport Beach, Calif., Aug. 13-17.

American Association of Nurserymen Management Seminar, Syracuse University campus, Aug. 13-18.

Canadian Parks/Recreation Association, 1972 conference, Ottawa-Chateau Laurier Hotel, Aug. 14-17.

Northern Michigan Turfgrass Field Day, Traverse City Country Club, Traverse City, Mich., Sept. 13.

International Pesticide Applicators Association, Inc., annual meeting, Thunderbird Motor Inn, Portland, Ore., Sept. 14-16.

Eastern Kentucky Turfgrass Field Day and Conference, Powell Building, Eastern Kentucky University, Richmond, Ky., Oct. 10-11.

Turfgrass Equipment and Materials Educational Exposition, 12th annual, Southern California Turfgrass Council, Brookside Park, Pasadena, Calif., Oct. 11-12.

Missouri Lawn and Turf Conference, 13th annual, Ramada Inn, Columbia, Mo., 8-9.

Nebraska Weed Control Conference, 26th annual, Holiday Inn, Kearney, Neb., Nov. 8-10.

Washington State Weed Conference, Chinook Motel and Tower, Yakima Wash., Nov. 15-17.

Nebraska Turfgrass Conference, Kellogg Center, University of Nebraska, Lincoln, Nebr., Nov. 20-22.

Ohio Turfgrass Conference and Show, Franklin County Memorial Building, Columbus, Ohio, Dec. 12-14.

Golf Course Superintendents Association of America, 44th annual International Turfgrass Conference and Show, Boston, Mass., Jan. 7-12.

California Weed Conference, 25th annual, Disneyland Hotel, Anaheim, Calif., Jan. 15-17.

Michigan Turfgrass Conference, 43rd annual, Kellogg Center, Michigan State University, E. Lansing, Mich., Jan. 16-17.

Southern Weed Science Society, 26th annual meeting, Jung Hotel, New Orleans, La., Jan. 16-18.

Virginia Turfgrass Conference, Sheraton Motor Lodge, Fredericksburg, Va., Jan. 30-31.

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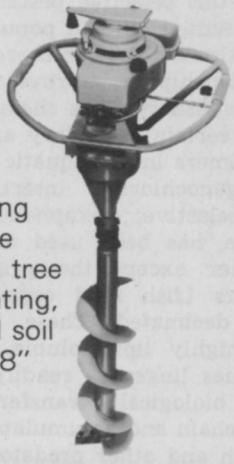

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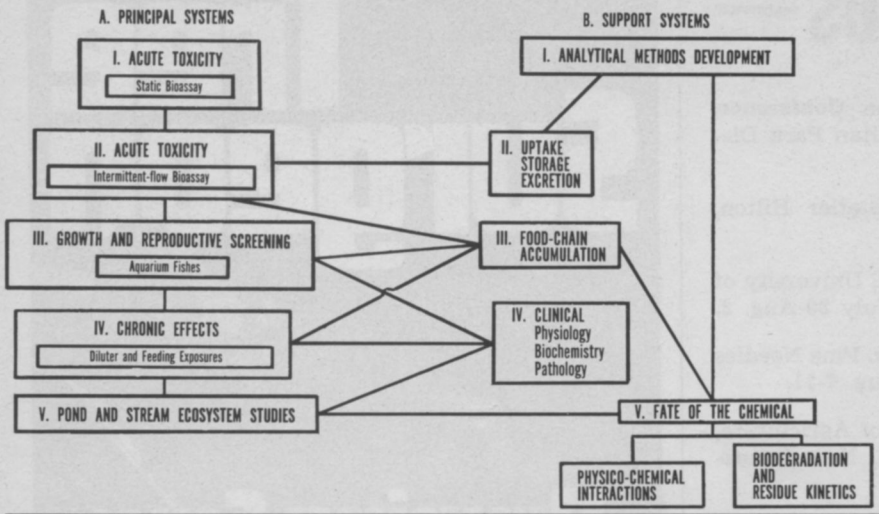
Table 1. The Organization of Research Activities at the Fish-Pesticide Research Laboratory.



WATER'S COMPLEX ENVIRONMENT *(from page 24)*

teratogenicity or reproductive failure.

Herbicides also have rated more attention since the controversy on 2,4,5-T and the contaminant dioxin induced abnormal fetuses in special strains of mice. Since some herbicides are used directly in water for control of aquatic plants to enhance fish production and the sport fishery, our investigations center on the fate of herbicide residues and effects on fish, fish-food organisms, and other aquatic organisms.

We have studied the effects of certain pesticides on the aquatic ecosystem in relation to maximizing production of sport fish populations. Antimycin, a potent fish toxicant that is a short-lived and non-residue producing chemical, has been used effectively to alter the structure of bass-bluegill populations. We have used this selective pesticide to thin out stunted bluegill populations and reinstitute a desirable predator-prey relationship to improve the quality of the fishery. This chemical affects only certain secondary and tertiary consumers in the aquatic ecosystem.

Organochlorine insecticides are non-selective; toxaphene, for example, has been used in a similar manner except the primary consumers (fish food organisms) are also decimated. These insecticides are highly lipid-soluble, and their residues linger — readily available to be biologically transferred up the food chain and accumulate in tissues of fish and other predators.

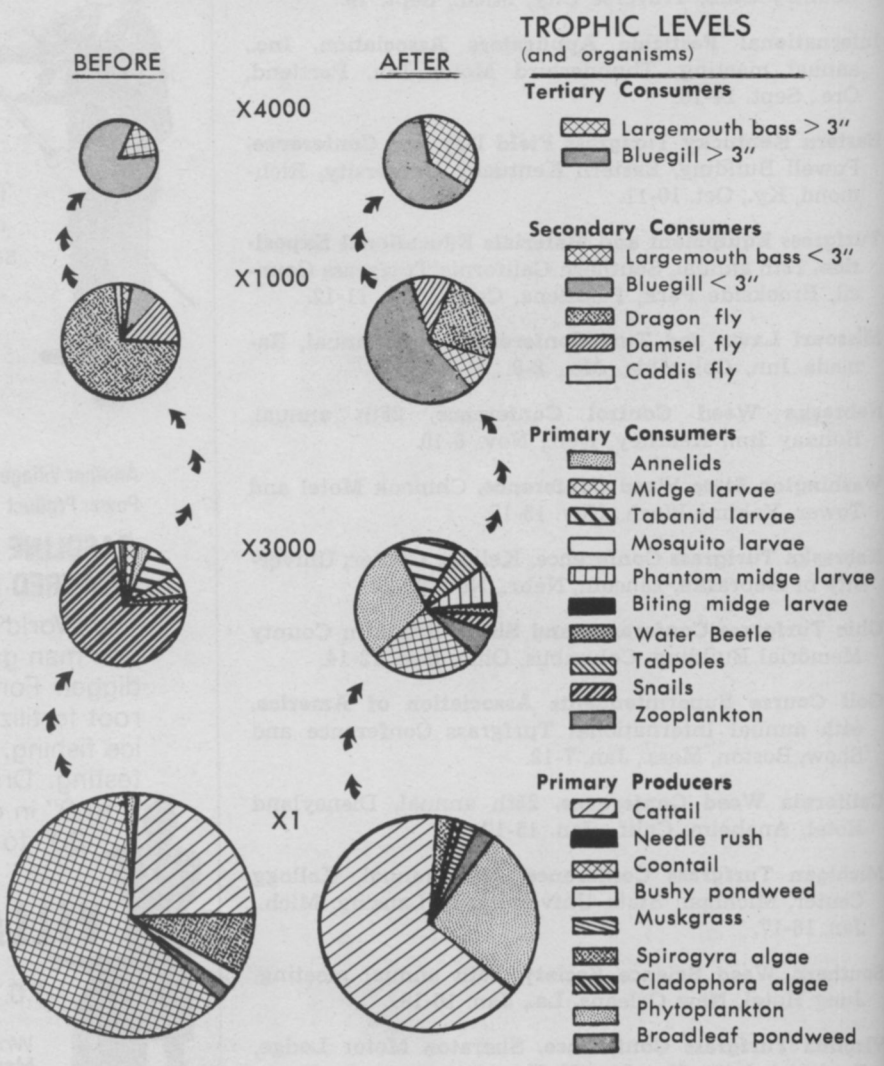
Herbicides are generally short-lived but have a much more subtle effect on the aquatic ecosystem. The aquatic plants or primary producer organisms are directly affected, as is the objective of the management biologists, although very frankly I feel that we are still in the "cave man era" and our management tools are often as crude as the stone axe or use of fire. The changes induced, however, are transferred all the way up the food chain and dramatically alter the flow of energy.

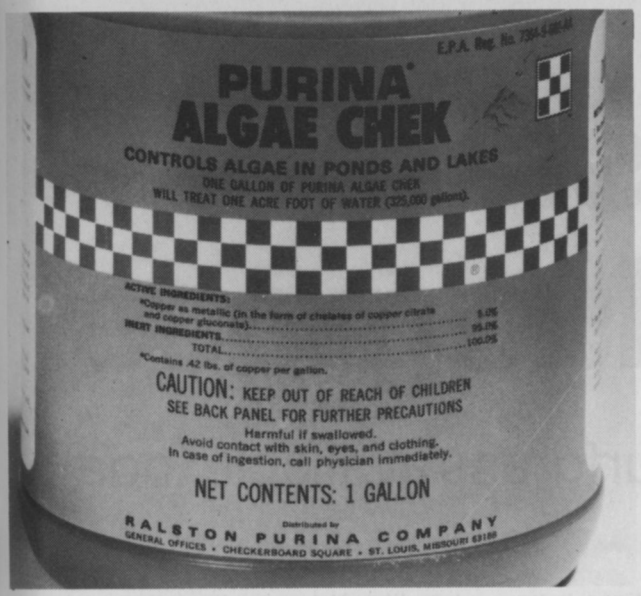
For example, sodium endothall is selectively toxic to certain submersed rooted plants and eliminates them from the habitat — releases these stored nutrients and energy to decomposer organisms (bacteria, etc.) which in turn feed diatoms, rotifers, protozoans, etc. (Figure 2)

This also changes some of the physical features of the habitat — weed clinging insect larvae and protective cover for the invertebrates and small fish are now more vulnerable to predation. Turbidity from the plankton is sharply increased but does not adversely affect feeding by predator-size fishes at the secondary and tertiary trophic level. The net result is a more efficient system for benefiting the desirable sport fishes. Removal of excessive plant growth redirects energy flow and

(continued on page 51)

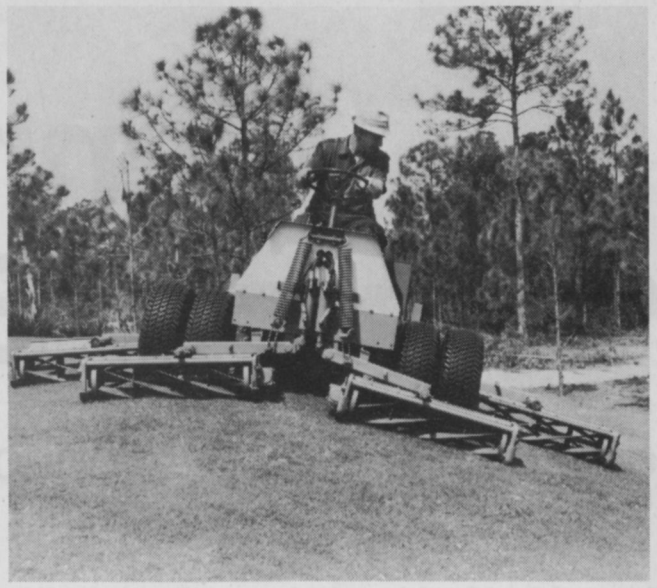
Table 2. Before and After Effects of 0.5 ppm disodium endothall on the specides composition and production of biomass in a 0.25 A pond ecosystem.





ALGAE CHEK: Ralston Purina Company, St. Louis, Mo.

Control algae in ponds and lakes by applying directly on surface algoe or injecting below the surface. This new product contains copper in the form of chelates of copper citrate and copper gluconate to check algae during peak growing periods. Used as directed it is safe in the presence of fish and may be applied by hand sprayer or motor powered units. Water can be used in livestock feeding immediately after treatment and no harmful residues are in evidence. It is marketed in gallon containers as a liquid to be mixed with water prior to application. It will not precipitate out or become ineffective in alkaline or hard water. For more details, circle (701) on the reply card.



HYDRAULIC LIFT MOWER:
Jacobsen Manufacturing Company, Racine, Wis.

This F-133 mowing tractor has been newly modified with a rugged hydraulic lift to raise and lower the mowing units. The operator no longer has to physically lock up or let down the gangs to move to a new location. This feature is beneficial around schools, parks, cemeteries, industrial grounds and golf courses. The F-133 cuts an 11 foot swath and is capable of mowing from 40 to 50 acres per 8 hour day. It has hydrostatic, foot controlled mowing speeds with variable cutting frequencies not dependent on travel speed. For more details, circle (702) on the reply card.

BATTERY-POWERED VACUUM: Parker Sweeper Company, Springfield, Ohio

Parker Vac-35 cleans up to 100,000 square feet before batteries require recharging. The unit features aluminum ball-bearing wheels with non-marking rubber tires, an exclusive Spin-pak air-guide which packs up to 20 percent more bulk-debris into the cotton fleecelined collector bag and accessible side-to-side batteries which provide 3½ to 4 hours of full power. The use of Cycolac color-impregnated thermoplastic for impeller housing and nose cone offers greater strength while the smoother finish of the material in conjunction with a steel liner insert allows an unobstructed air flow and increased life capability. The new battery-powered vacuum carries the Factory Mutual seal. For more details, circle (703) on the reply card.

PORTABLE HI-PRESSURE SPRAY MODULE:
Wayne Engineering Corp., Cedar Falls, Ia.

Clean equipment normally found in a park system with this new truck mounted high-pressure spray module. It can be mounted between the cab and body of a pickup truck, dump or refuse body. The module consists of a high-pressure pump that delivers 5 gpm at 1000 psi, a 40 foot hose, a hand-held wand with rotating 4-jet spray pattern and a 100 gallon storage tank. Specific concentrates are automatically metered to the water line. A storage compartment is incorporated to carry pails, brooms and other equipment. Total dimensions are 22 inches deep and 84 inches in width. It is powered by the truck's hydraulic system. For more details, circle (704) on the reply card.

Pennstar Kentucky Bluegrass.

Perhaps the best all-around turfgrass available today.

Highly resistant to stripe smut, rust and leaf spot. Stripe Smut (Ustilago striiformis) sporlates in May or June, shredding individual leaves. Field trials show that, while Merion is quite susceptible, Pennstar is highly resistant. A very strong plus.

Pennstar is also highly resistant to rust (Puccinia spp). Rated on a scale of 0 (best) to 10 (worst), test data give a 1.7 rating to Pennstar versus 8.7 for Merion.

Most improved bluegrass varieties are resistant to leaf spot (Helminthosporium vagans). However, in university tests, Pennstar was significantly *more resistant* than some improved varieties.

Well adapted from the East Coast to California. Pennstar's disease resistance, drought resistance and other characteristics enable it to do well wherever Kentucky Bluegrass is adapted. It establishes well and resists fadeout under a wide variation in management.

Medium color, good density, easy to manage. With its pleasing medium bluegrass color, Pennstar blends well with other varieties. In mixtures, it's neither too dark nor noticeably light.

Pennstar persists at moderate-to-low fertility levels. It doesn't over-react to higher fertility. Because it's decumbent (the leaf angle is closer to 90° from vertical than 45°) Pennstar can tolerate a close mowing without thinning out. And it's shown the ability to withstand drought conditions better than some other Kentucky Bluegrass varieties.

No excess thatch after 11 years. Pennstar does not produce damaging quantities of thatch. In tests at Penn State, plots of Pennstar torn up after 11 years revealed no excess thatch. (No dethatching had been done in that entire period.) Normally aggressive varieties can be expected to thatch up under good management practices. Not Pennstar.

Ideal component for turf mixtures. Is it better to plant a single variety or a blend? This is the difficult question that confronts turf managers. A single variety planting is undeniably beautiful. Yet a single strain can be destroyed by disease or weather. Which is why Pennstar was developed — to make available a bluegrass variety that would be highly resistant to disease and capable of surviving extreme weather conditions.

These qualities make Pennstar very suitable for a mono-culture. Or a mixture, particularly when considering its other characteristics: It's not overly aggressive. It's easy to manage. Its pleasing texture and middle-of-the-road color make it visually compatible with other varieties. Indeed, Pennstar blends so effectively, it could help convert some managers to mixtures.

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PENNSYLVANIA STATE UNIVERSITY

Pennstar Kentucky Bluegrass
(Poa pratensis)

Pennstar is an improved variety that has been released by Penn State after over 15 years of testing and evaluation. Pennstar is outstanding for disease resistance and for compatibility with other improved grasses in turf mixtures. Pennstar is not overly aggressive and is compatible with other varieties. Pennstar is persistent; reasons include its ability to withstand low mowing, its high reisistance to disease and its ability to compete under low fertilization.

Some expert (and unbiased) opinions.

"Disease resistance was good, it had an attractive color, texture, and a good growth habit. The most significant item was its good performance under relatively low levels of fertility."

"In our trials, Pennstar has been the best variety for which seed is available."

"Average quality ratings (9 = best) based on density, color and uniformity placed Pennstar highest with a score of 5.6 as compared to other varieties such as Geary 5.0, Merion 4.0 and Windsor 3.8. These particular plots have been under minimum maintenance and care."

Turf Buyers' Checklist

IDEAL	Pennstar
1. It should be able to survive periods of drought.	1. In field tests, Pennstar has survived extended periods of drought. ☑
2. It should be able to survive with moderate fertility.	2. Pennstar requires only the moderate management typical of most bluegrasses. ☑
3. It should be decumbent in growth habit so it can be mowed short without thinning out.	3. Pennstar's decumbent growth habit permits it to be mowed very short without thinning out. ☑
4. It should not be overly aggressive—should not crowd out companion grasses.	4. Pennstar will hold its own against overly-aggressive varieties, but does not crowd out less aggressive types. ☑
5. Its color should not be so dark or so light as to give a mixture a mottled appearance.	5. Pennstar has a pleasing medium blue-green color that blends well with all other varieties. ☑
6. It should not "go wild" when fertilized. Emergence and growth rates should be moderate.	6. Pennstar's rate of growth is not overly affected by increased use of fertilizers; its emergence and growth patterns are moderate. ☑
7. It should not produce excess thatch, even after years of establishment.	7. Pennstar produced practically no thatch in 11 years of testing. ☑
8. It should be highly resistant to common diseases, and particularly to "killer types" such as stripe smut and leaf spot.	8. Pennstar is practically immune to leaf spot, highly resistant to stripe smut. ☑
9. It should be widely adapted throughout the zone of species adaptation.	9. Pennstar is widely adapted from California to the East Coast, in all the normal bluegrass areas. ☑
10. It should be well tested for a period of years over many locations so that its characteristics are well understood.	10. Pennstar has been tested for 15 years in locations from coast to coast. ☑

After you've checked them all . . . Pennstar

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Pros and Cons of Rolled or Palletized Sod

By ROBERT HAWKINS
Robert Hawkins Landscaping
Germantown, Maryland

WHEN discussing the advantages and disadvantages of rolled sod versus palletized sod, you must consider how the sod is marketed and sold.

First, you have the retail market in which a business produces and harvests sod and sells it in the field loaded or delivered. The second category is the business that either produces or buys sod from a producer and harvests, loads, transports and installs practically all of it to builders, developers, home owners, etc. Make no mistake about it, this is how the largest volume of sod acreage is sold.

If I were the first category or the retail market, I too, would use mechanized harvesting equipment and palletize my sod for the simple reason that it is easier to load and account for your sod, such as 55 square yards per pallet, etc.

But, I install most of my sod and the reasons why I prefer manually rolled sod are as follows:

1. **Convenience**—If I have a small crew of men, I can send a few trucks to the sod field in the morning, cut, roll, and load these trucks, take them to the job with these same men and install the sod that same day.

If I have a large enough crew of men, I can have one crew cutting, rolling, and loading sod in the field all day, another crew installing the sod on the job all day, and trucks going back and forth delivering the sod. Either method is convenient in that it is easily controlled.

2. **Time saved**—Time is money, and we all try to save time. I will concede that mechanized harvesting and palletizing of sod is as fast as a small crew of four or five men who manually roll and load sod. But there are sod businesses that cut, roll and load manually up to 2 and 3 acres per day! There is no way this can be done with a palletizing operation feasibly.

In addition, we roll our balls of sod 1½ to 2 square yards per ball whereas, palletizing, the most in one section of sod is one square yard. Now, this doesn't have much bearing on the time saved in the field. But when you are installing sod, time is saved. It is here where I find the biggest disadvantage of palletized sod.

When you lay sod off the truck of manually rolled sod, you simply pull alongside the area to be laid, and the crew simply takes a roll off the truck, lays it down and goes back for another. Each time a man lays a roll of sod he is putting down 1½ to 2 square yards. With palletized sod, it would only be ½ to 1 square yard. You can readily see that it would take twice as many trips to the truck for a section of sod and twice as long to lay a load.

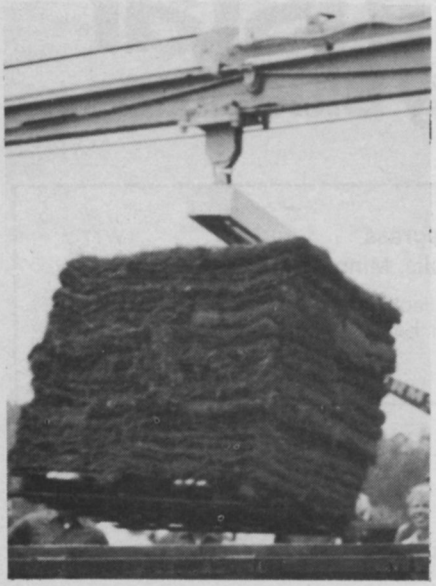
Don't get me wrong, I am not talking about slapping down the sod any way at all, but doing a neat job, with square ends.

If you use a fork lift to spot your pallets when laying palletized sod, you often run over finished grade causing compaction and tracks that must be raked out. Also, you must lay sod all around the pallet. When it is empty, you have an uneven hole that must be patched in. This may not sound like much of a problem, but consider doing this for, say, 100 pallets per day and you will realize this is a lot of time lost. Another problem is gathering those 100 pallets at the end of the day and loading them on a truck to use again.

There are those that will argue that the smaller sections of palletized sod are lighter and, therefore, a man can handle them faster. This is not true because we generally cut our sod thinner when handled manually and, therefore, two square yards rolled is no heavier than a one square yard section on pallets.

Time is also saved in the transportation of manually rolled sod. A 2 or 2½-ton truck can carry approximately 6 pallets of sod, or about 330 square yards. You can carry anywhere from 400 to 600 square yards

Palletized Sod



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on the same truck depending on soil conditions of the sod.

As an example, it would take about 15 loads on a 2-ton truck to transport an acre of sod, but you could transport an acre of manually loaded and rolled sod on about *10 loads,* a 33% savings in transportation costs alone!

3. **Equipment Investment**—In order to have a mechanized and palletized operation, you must have a sod harvester, 2 fork lifts and a very good supply of pallets with an initial investment of $30,000 or $40,000 compared to a manually rolled operation consisting of a sodcutter with an investment of $1,500 or $2,000.

If you deliver sod to retail stores, you must have boom trucks to unload the pallets of sod at a cost of $20,000 to $40,000 compared to a truck transporting manually rolled sod at a cost of $5,000 to $8,000.

Pallets are a very costly part of the palletizing operation. They cost from $2.00 to $4.00 each and can only be used 3 or 4 times. They are often broken and lost. Figuring in detail the cost plus the time spent on transporting, loading, moving pallets, etc., you would find that pallets cost 3 or 4 cents per square yard of soil. You do not have this cost in manually rolled sod.

The time saved in installation of sod, the convenience and the equipment costs cannot be equalled by the machanized harvesting and palletizing methods as they exist today. This is the reason that the vast majority of sod is manually rolled. I am a firm believer in mechanization and I should hope that in the very near future we can develop a system and related equipment. The labor situation is so critical today in our industry that in the next 5 years it will be absolutely imperative to cut, roll, load and install sod with machinery, because there will be no men available to do it manually.

DDT Degrades In Lakes Faster Than In Soil

DDT is much less persistent in most lake sediments than it is in soils on land, according to two University of Wisconsin water chemists.

"While DTT in terrestial soils remains for many years, in lake sediments without oxygen much of the pesticide is degraded within weeks," said Ralph C. O'Connor. "This does not mean DDT in lakes is not dangerous, for it is uncertain how much is picked up by aquatic organisms before reaching the sediments."

O'Connor, a water chemistry graduate student working with Prof. David Armstrong, announced the findings at the recent 15th Conference on Great Lakes Research. The conference, which has attracted more than 600 scientists from Canada and the United States, is sponsored by the International Association for Great Lakes Research.

The two scientists investigated the rate and extent of DDT degredation in sediments from Lake Michigan's Green Bay and three other Wisconsin lakes.

"In sediments without oxygen there are about 20 types of common bacteria able to degrade DDT," O'Connor said. "In our laboratory tests, at least 25 percent of the DDT was degraded within two weeks, and more than half degraded within two months."

The actual amounts degraded are probably even greater, he said, but since only these amounts of the breakdown product were recovered, they can be considered the minimum degraded. The fate of much of the DDT not recovered still is uncertain.

Many lake sediments are of the anerobic (without oxygen) type, particularly those found where streams empty into a lake, he noted.

Another significant difference between the degredation process in lake sediments and terrestial soils is that the breakdown product, DDD, is often less dangerous.

"While DDD is still toxic, it does not have the same long-term effects as some of the other metabolites," he said. "For example, it is not involved in reproductive failures like the egg shell thinning caused by DDE."

This study, funded by the UW Sea Grant Program, is the first quantitative measurement of DDT degredation in anerobic lake sediments.

"Until now, sediments have often been ignored in examining the fate of DDT in the environment," O'Connor pointed out. "These results, however, indicate that sediments are important and must be considered in future research."

Lake Bacterial Population Upset By Certain Herbicides

Indiscriminate use of herbicides could upset the balance of nature in lakes by distorting their bacterial populations.

This was the conclusion two Clemson University microbiologists reported to the American Society for Microbiology in April.

Dr. Rufus K. Guthrie and doctoral student Robert N. Ferebee said that a drastic change in number or types of bacteria in a lake could by reducing those bacteria that break organic matter down into usable nutrients, cut off vital food supplies for other forms of plant and animal life in the lake.

Reporting on one of the first research projects ever conducted to find out how different herbicides alter the balance of bacterial populations common to an actual fresh water lake Guthrie said, "We've found that some herbicides have little effect on the bacteria, while other herbicides tend to stimulate the growh of certain bacteria, depress the growth of others, or both."

It is this reduction in diversification or variety of bacterial types that poses a threat to the delicate balance of nature in the lake environment, he said.

The Clemson scientists studied three chemicals, each representing general herbicide types that might commonly wash into local fresh water reservoirs, during their two-year project:

1. common 2,4,5,-T had little or no effect on bacteria.
2. paraquat stimulated the greatest total growth of bacteria but favored cerain types of bacteria.
3. diuron caused a noticeable drop in total number and bacterial types.

"The point is that we've now shown that different kinds of herbicides might produce very different kinds of effect on the vital bacterial community of a lake," Guthrie said.

Spruce Budworm Attractant Discovered by Scientist

Sex attractants, a technique of prominence in the fashion and cosmetic world, are finding a place in controlling the spruce budworm, one of the most destructive forest pests in North America.

Dr. Iain Weatherston of the Insect Pathology Research Institute, Dr. Christopher Sanders of the Great Lakes Forest Research Centre—both located in Sault Ste. Marie, and Dr. Wendell Roelofs and Dr. Andre Comeau of the entomology department at Cornell University have isolated and identified a sex attractant given off by the female moths to attract the males for mating.

Now that it is identified, the sex attractant of the spruce budworm can be manufactured in large quantities. Applied over an area where spruce budworm inhabit, the chemical can be used to disrupt mating habits.

These scientists have also discovered two chemicals which inhibit the male budworm's reaction to the attractant. These are substances which are very close in molecular structure to the sex attractant. The way in which they act is not fully understood, but they probably block the receptor sites on the males' antennae, so that the attractant given off by the females cannot be perceived by the males.

Future widespread use of these chemicals is anticipated as these substances are naturally occurring and are readily broken down in nature. Preliminary estimates indicate that only 100 milligrams would be needed to treat an acre of forest at a cost of about 30 cents.

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— insect report —

INSECTS OF ORNAMENTALS

SPIDER MITE
(Platytetranychus thujae)

PENNSYLVANIA: Adults collected on arborvitae, 4 miles west of Camp Hill, Cumberland County, May 17, 1971. This is a new State record. This mite also collected on various dates and at several locations in State in 1971 on juniper.

TREE INSECTS

COOLEY SPRUCE GALL APHID
(Adelges cooleyi)

COLORADO: Abundant, 5 galls per 40 twigs, at Fort Collins, Larimer County. Most numerous in 4 to 5 years.

DOUGLAS FIR BEETLE
(Dendroctonus pseudotsugae)

ARIZONA: Increased on north rim of Grand Canyon National Park; 400 mature and over mature Douglas fir trees attacked over 600-acre area.

ELM LEAF BEETLE
(Pyrrhalta luteola)

KANSAS: Some pupation reported in Manhattan, Riley County, and in Topeka, Shawnee County. Siberian elms in Topeka up to 50 percent damaged. OKLAHOMA: Damage increased in most areas of State; defoliation ranged up to 60 percent in Payne County. Heavy in Bryan, moderate in Okmulgee, Murray and Ponotoc Counties. NEW MEXICO: Light to heavy on elms at Albuquerque, Bernalillo County, and at Tularosa, Otero County. COLORADO: Egg hatch about complete in Arkansas Valley; larval damage appearing on elm trees.

PINE SPITTLEBUG
(Aphrophora parallela)

MISSISSIPPI: Light to moderate on loblolly pine statewide. Ranged 2-3 per tree in Grenada and Montgomery Counties.

LARGE ASPEN TORTRIX
(Choristoneura conflictana)

MINNESOTA: Aerial survey conducted in St. Louis, Lake, and Cook Counties to determine gross defoliation area. Defoliation generally light immediately northeast of Duluth; may be due to unseasonable cool spring weather retarding development. Areas farther north and northeast to Canadian border showed large areas of moderate defoliation with some heavy defoliation in Finland and Tofte areas and adjacent to the Sawbill Trail. Spotty, light to moderate defoliation noted in Carlton County.

LEAFMINING WEEVIL
(Odontopus calceatus)

WEST VIRGINIA: Adult damage heavy to 90 percent of foliage of most yellow-poplar in Clay County.

SPRING CANKERWORM
(Paleacrita vernata)

NORTH DAKOTA: Larvae in last larval stage defoliated single row Siberian elm shelter-belt trees in Burleigh and McLean Counties. Up to 100 percent of trees in some plantings totally defoliated.

BOXELDER LEAFROLLER
(Gracillaria negundella)

UTAH: Foliage damage severe on several thousand boxelder trees in Davis, Salt Lake, Utah, Box Elder, and Cache Counties. Many hundreds of these trees show no leaf color.

PINE TUSSOCK MOTH
(Dasychira plagiata)

MINNESOTA: Overwintering second-instar larvae feeding on jack pine needles in east-central area. Winter survey collections, as well as early larval checks, indicate populations reduced in Pine County from 1971. At this time, no controls expected in 1972.

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HOW WE REDUCED DRIFT *(from page 16)*

ran some special tests earlier this year to evaluate the Directa-Spra as an aquatic herbicide applicator. It had been used successfully on most every formulation of herbicide for brush and weed control, but we wanted a close look ourselves over water hyacinth.

The applicator, which weighs only a few pounds, has a small motor that operates from the 12-volt battery of whatever spray vehicle it's attached to.

A hollow shaft passing through the control box carries the herbicide to the hub below where 8 tubes radiate like wheel spokes. Each tube can be tipped with a nozzle that has 5 openings, and you can spray with or without the nozzle tips depending on the desired pattern or mixture being used.

The "wheel" revolves at 70 rpm, throwing the spray in a circular pattern. To set up for the correct volume, the size of the opening at the shaft base is adjusted. Arc of the spray pattern can also be adjusted to 90, 180 or 360 degrees.

Our tests, which took place at the Tenoroc Mine near Lakeland, compared various phenoxy formulations: esters, amines, oil soluble amines, and invert emulsions. We had two booms, one on each side of the airboat acting as arms to hold the Directa-Spra units. Running through heavy infestations of water hyacinth, we were able to put spray right on top of the plants.

Figure 1 shows the various commercial and experimental treatments used in these tests. Although data from actual evaluation is not yet compiled we have shown a visual estimate on the percent of control. Skips were evident in all plots. This can be expected with any type of spray equipment because of wind, weed movement and other factors.

One interesting point to note is that a great number of chemicals, used both conventionally and as an invert, can be sprayed through the Directa-Spra system. Because of its compact size, it was easy to clean and prepare for different chemical tests.

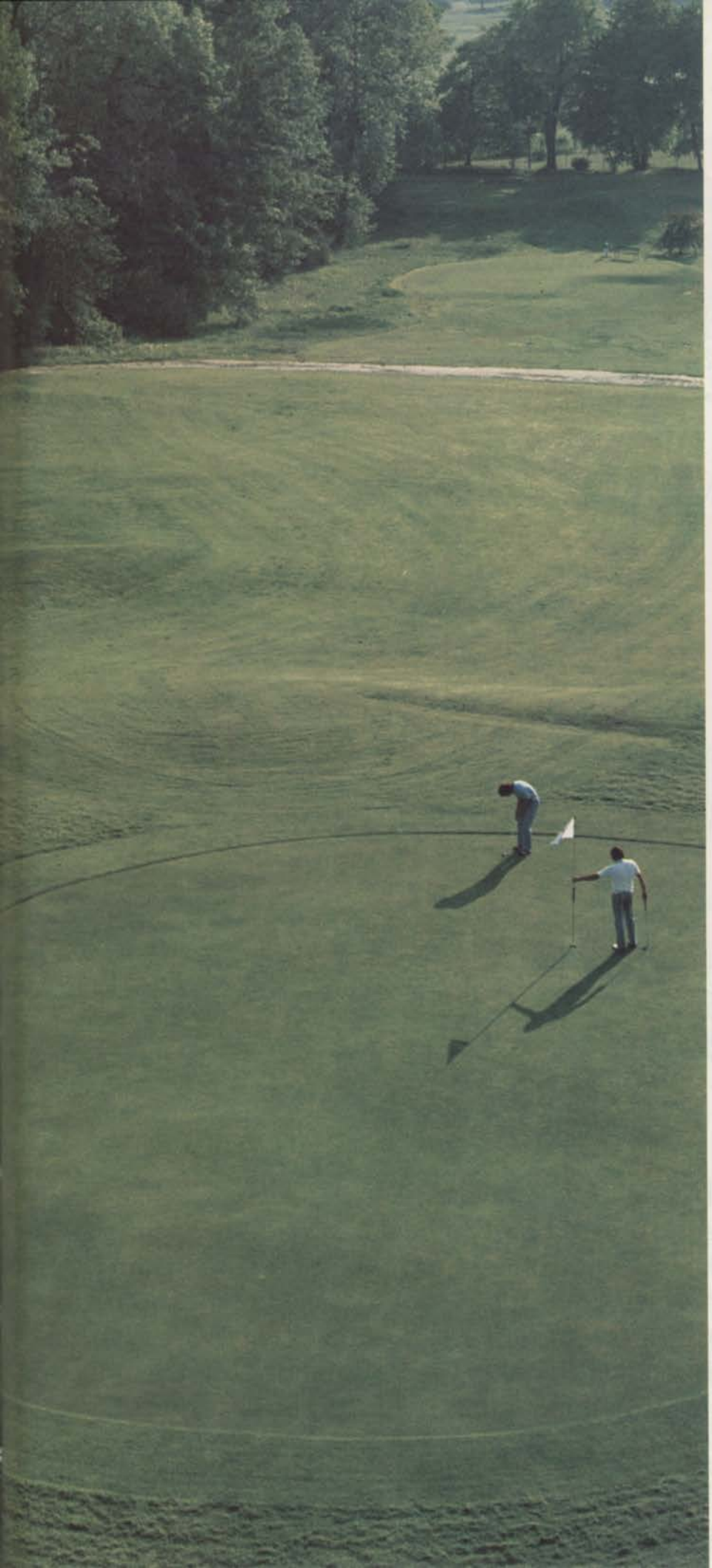
When it was all over, the oil soluble amine, E-3, looked superior for controlling water hyacinth. To more completely solve the drift problem, we added Lo-Drift spray additive to the E-3. The thickening agent, which makes spray adhere to the plants, also kept us from having any washoff due to propblast.

Even though I plan to run more tests, I have to say that putting Lo-Drift with E-3 through the Direct-Spray applicator looks like a good—essentially drift-free—spray system.

Figure 1. Directa-Spra Trials on Water Hyacinth — Florida

Commercial or Experimental Treatment used[4]	Rate lbs. a.i.[3]	Carrier Used[1] (gallons)	Visual estimate of percent Brown-out (evaluation[2])
Weedone 170	4	89 H_2O	No evaluation. Hyacinths washed out of plot area
LV-4	4	70 H_2O	65 - 70 percent
2, 4-DP	4	70 H_2O	60 percent
MCPA	4	70 H_2O	80 percent, Plot looks very good, excellent burn
W-170	4	70 H_2O	25-30 percent
71-44	4	70 H_2O	40-50 percent
W-64	4	70 H_2O	65 percent
Emul. E-3	4	70 H_2O	40 percent
Brominal Ind.	1	70 H_2O	Very small amount of burn evident
Emul. E-3	5	70 H_2O	No evaluation, Plot too scattered to evaluate
Emul. E-3	4	70 H_2O	75 percent, Hyacinths that were sprayed 95% skips knock down
Emul. E-3 + Lo-Drift	4	70 H_2O	85 percent, Lo-Drift plots are best looking.
Emul. E-3 + Lo-Drift	4 + 1 qt.	35 H_2O	90 percent
Emul. D.	4	2 Chemicals 12 Oil 56 H_2O	35 percent
Weedone BK-171[5]	4	2 Chemicals 13 Oil 56 H_2O	50 percent, Coverage very uniform, but very little brown-out.

[1]Applications were made to one acre plots in mid-and late-March. No nozzle tips were used.
[2]Evaluation was conduced by John Gallagher and Richard Messinger, Amchem Products, Inc.
[3]The purpose was to evaluate various formulations of 2,4-D, 2,4-DP and Brominal applied with Directra-Spra. A John Bean piston pump (10 gpm—7 Hp) was mounted on an airboat.
[4]Application was made by the Florida Game & Fish Commission.
[5]Would not invert.



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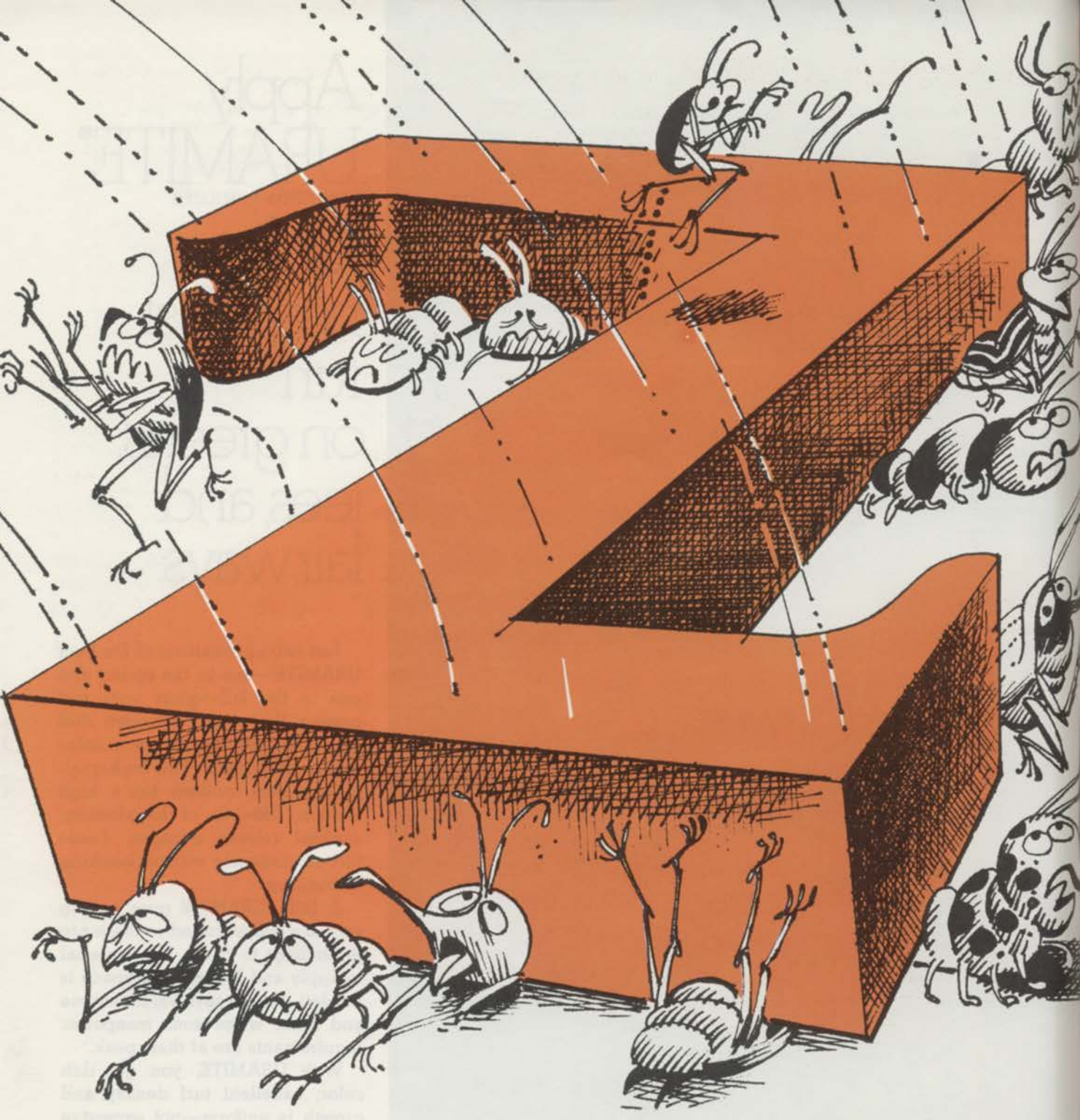

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For more Details on Preceding Page Circle (103) on Reply Card

For More Details Circle (128) on Reply Card

WATER'S COMPLEX ENVIRONMENT *(from page 40)*

improves fish growth rates — increases in production and catch per unit effort are evidence of improvement in the sport fishery.

There are those who look critically at technological innovations — oppressed by fear of deterioration of the environment. They are somewhat justified by numerous examples, even though many are exceptions to general rule. In the meantime, the air becomes polluted with the exchange of emotional charges followed by the frustrations, despondency or apathy of the public or officials to find solutions to the "problems."

They seriously question man's responsible relation with the native flora and wildlife of this earth . . . and logically question if these are the same people who plunder for sake of profit and deny these forms of life a share of the environment based solely on materialistic cost-benefit ratios. These repeated cries of alarm about our environmental crisis are similar to the Aesop Fable of the boy who cried wolf — unfortunately, well-meaning scientists also sound alarms, and often about matters far removed from their own special area of competence.

Is it any wonder that the public becomes disillusioned with science and scientists — and then suspicious of our technological improvements? We have enough anti-intellectualism without precipitating such a dominant force that may well result when we allow spirited scientific debate to escape these halls to the public arena. Our understanding is based upon respect for different viewpoints but with critical evaluation subjected by the multidisciplinary scientific commmunity. The work and opinions of some colleagues have been exploited and eventually become subjected to the "headline hunting."

Thus, we cannot afford to ignore the special responsibility of the scientific community to both consider the "good" and the "adverse" effects of chemicals as contaminates.

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Aquatic Weed Harvester Invented by Floridian

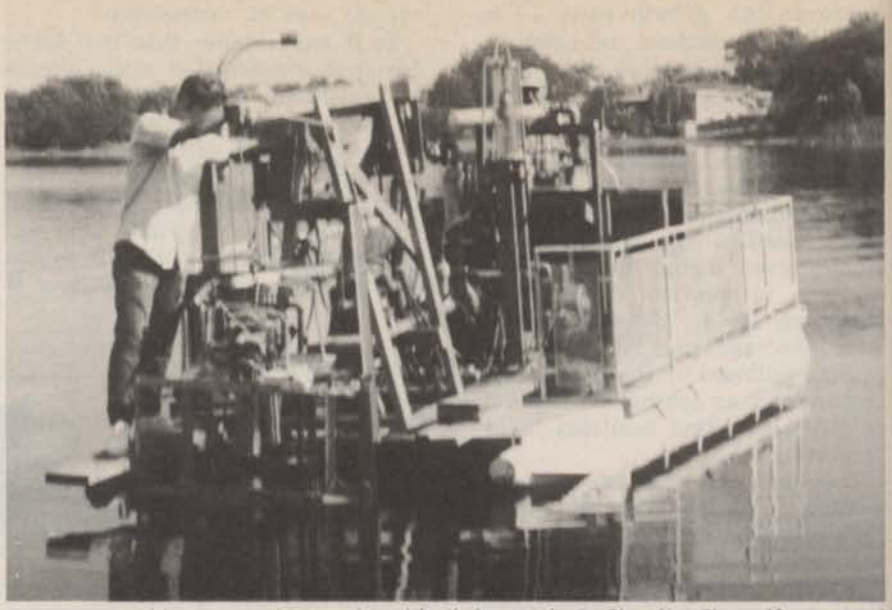
Lake and waterway reclamation from aquatic plants is a never ending source of concern. Lack of adequate equipment constitutes one of the main reasons why progress has been slow.

Now someone is doing something about it. He is Merle P. Chaplin of Winter Park, Fla. who has spent the last few years engineering and inventing mechanical lakeweed removal equipment.

Chaplin has built a number of experimental harvesters and developed a plan of restoration.

While some view Chaplin's drawings and prototypes as a Jules Verne classic, others extol the benefits of their innovator's knowledge. Researchers have long recognized that finding useful products made from aquatic plants would greatly stimulate efforts to bring like weed problems under control.

Essentially, Chaplin has combined a rotary cutter, suction pump, compressing chamber, baler and other equipment into an efficient harvesting machine. He and Dorman Myers of Apopka, who joined Chaplin in 1969 and invented one of the harvesters, are convinced that they now have the equipment needed to control hydrilla and other aquatic weeds in Florida.



Aquatic weed harvester designed and built by Merle P. Chaplin. The self-contained unit is capable of deep water weed removal. Vegetation is placed in baskets, sterilized and baled.

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SOD QUALITY MERION SEED for discriminating growers. Also Fylking, Delta, Park, Newport, Nugget and Pennstar bluegrasses as well as fine fescues. We will custom mix to your specifications. Michigan State Seed Company, Grand Ledge, Michigan 48837. Phone 517 627-2164.

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MISCELLANEOUS

TREE APPRAISALS, SURVEYS, loss evaluations and expert consultation services. For names of members of the American Society of Consulting Arborists, Inc., throughout the country, contact: Executive Director ASCA, 12 Lakeview Ave., Milltown, New Jersey 08850.

HELP WANTED

EXPERIENCED TURF FARMERS— Rapidly expanding Colorado turf farm seeks one each: Cutting foreman, Installation foreman, Irrigation man. Outstanding future with growing corporation. Excellent salary, hospitalization, insurance and other benefits. Apply giving experience and past work history to: Personnel Mgr., Reynolds Turf Farms, Inc., P.O. Box 595, Brighton, Colorado 80601.

USED EQUIPMENT

RECONDITIONED brush chippers, sprayers, log splitters, stump routers, bucket trucks. Let us know your needs. Equipment Sales Company, 5620 Old Sunrise Highway, Massapequa, New York 11758. Phone 516 799-7619.

FOR SALE—Ryan sod harvester, 18 in., one year old, mounted on Ferguson 35 tractor, can see this cutter in operation at sod farm. Total price $6700.00. Gettemyer Sod Farm, R2, St. Peters, Missouri 63376. Phone 314 278-3388.

IRRIGATION PUMP. Hale 6" pump powered by Chrysler industrial engine with aluminum suction pipe with strainer, good condition. Steve Antonoff, Jr., 1697 Western Reserve Rd., Poland, Ohio 44514. Phone 216 758-1801.

FOR SALE. 1964 Hahn Hi-Boy with 200 gallon steel tank, drop spray nozzles, new boom and new pump. V-4 Wisconsin air-cooled motor with transport trailer. Call Western Fertilizer, Burlington, Colorado 80807. Phone 303 346-7209.

WANTED: Used Vermeer tree spade. Preferably from Midwestern States. Please give complete information in first letter. Linn Farms, Inc., Box 539, Canton, Ill. 61520. Phone 309 647-0148.

FOR SALE

DOUBLE EDGE sod cutter blades. Will fit any Ryan sod cutter. Works like double edge razor blade. Cuts much more sod per blade. Made to bolt on both ways. $24.00 plus postage. New automatic sod loaders for direct loading to pallets, trucks or trailers. No workers needed on ground. Both products developed and designed by Hadfield. Write or call Glen Hadfield, 4643 Sherwood, Oxford, Michigan 48051. Phone 313 628-2000.

POSITIONS WANTED

LANDSCAPE NURSERYMAN— Married, age 33, 8 years experience. Wishes to relocate in the midwest. Highly qualified in all phases of high quality landscaping including maintenance, turf management, pesticide application, growing of plant material, and sales. Desires position as park superintendent, grounds foreman or working partner in landscape nursery. Presently owner/operator of own business. Excellent references. Box 86, Weeds Trees and Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

Creative Landscape Architect

We represent a large Atlanta, Georgia based real estate development company. Our client currently seeks a landscape professional with a thorough knowledge of creative gardening and landscape planning in the Atlanta climate environment. The individual selected will be responsible for the planting and maintenance program for large commercial, industrial, and residential developments. He will further supervise the activities of two nursery farms. 2-5 years experience with a degree in environmental design, horticulture, or appropriate field experience are necessary.

Compensation to $20,000 to start.

Contact in confidence Mr. C. E. Howe:
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—Advertisers Index—

Adelphi Kentucky Bluegrgass 48
Adventure Line Mfg. Co. 38
Agric. Alumni Seed Assn. 25
Air-Lec Industries, Inc. 31
American Excelsior Co. 36
Applied Biochemists, Inc. 22
Asplundh Chipper Co. 11
Beck Mfg. Co. 52
Bowie Industries, Ind. 34
Brillion Iron Works, Inc. 47
Brouwer Mfg. 46
CLM National, Inc. 3
Diamond Shamrock Chemical Co. 5
Dow Chemical Co. 9, 50
E. I. duPont de Nemours & Co., Inc. ..... 2nd cover, 49
Elanco Products 28-29
Flymo Div., Keltec, Inc. 19
Ford Tractor & Implement Operations 7
Hays Mfg. Company ..... 3rd cover
Jacklin Seed Co., Inc. 6
JLM Products & Design 51
Lofts Chanderlin Seed Co. ..... 4th cover
J. J. Mauget Co. 8
3M Company 33
Magline, Inc. Trailervator Div. 37
Merck, Chemical Div. 21
Mobile Aerial Towers, Inc. 37
John Nunes Mechanicql Harvester 51
Pennstar Kentucky Bluegrass 42-43
Pennwalt Chemicals Corp. 40
Rain Bird Sprinkler Mfg. Corp. 17
Roof Mfg. Co. 32
Scott Young Co. 35
Servis Equipment Co. 23
Shell Chemical Co. 15
Skyworker Corp. 31
Vermeer Mfg. Co. 45
Village Blacksmith 39

"Down south their snow is green and they cut it with a funny put-put machine every week or so."

— trimmings —

TRY BEER to rid slug problems, if you don't want to use pesticides. The only equipment you need is a flat pan and a goodly supply of the malt brew. Pour the beer in the pan. At night the slugs will venture out, head for the pan and try a few sips. Once they sample the brew they can't seem to struggle (or stagger) back out of the pan. The more stale the beer, the more the slugs seem to enjoy it.

SIBERIAN ELMS are being hit by a canker which so far has no cure. These trees are fast growing and are often found in shelterbelts and urban areas. The disease is not associated with Dutch Elm Disease. Dr. Jack D. Otta, South Dakota State University, says that there is no known cure for the disease. Developing a tree resistant to the disease appears to be the only solution as of now—and that is a long and difficult process.

FUMIGATION BY FOAM permits the use of 25 percent less chemical, reduces the possibility of pollution and saves labor. H. J. Braud of Louisiana State University mixed methyl bromide with foam, applied a four inch layer broadcast and saved $75 per acre. He believes the total cost can be cut even further—perhaps in half. The foam last about three hours. The insulation traps solar heat and surface temperature under the foam climbs as high as 125 degrees F. This kills young weeds as well as nematodes.

WORLD'S LARGEST CARPET is at present spread over a sports ground in the southern sector of Vienna. Developed by the firm Bunzl & Biach in conjunction with landscape architects, it consists of rotproof synthetic material containing an appropriate distribution of grass seed. When exposed to sun and rain, the seed germinates and within a month or two forms a durable turf.

THE POPULATION EXPLOSION of flies can leave rabbits sitting on their cottontails. Progeny from a pair of flies mated in April, if all lived, would result in 191,010,000,000,000,000,000 (191 quintillion, 10 quadrillion) flies by August. If you figure one-eighth of a cubic inch per fly, this number would cover the earth 47 feet deep.

FORAM CHEMICAL COMPANY is marketing a new foam adjuvant known as Chemfoam. A marketing team of specialists consisting of Byron C. Stark, Tom G. Dunn and Howard Rampy, Jr., are promoting foam as a means by which the applicator can substantially reduce drift and its damage. All were formerly with another Texas based firm. Rampy says that the company is service and technically oriented to market this new spraying concept.

WATER CONSUMED BY BRUSH and weeds is nearly 20 times as much water as all of the cities, industries and irrigation farmers in Texas use, according to J. Phil Campbell, Under Secretary of Agriculture, who spoke before a Texas audience. Excessive brush is a problem to all Texas water users. A 1964 survey showed that 88 million acres, or 82 percent of Texas grasslands, were infested with brush which was using an estimated 138 million acre-feet of water annually.

GYPSY MOTH STRIKES AGAIN. That's the word from Missouri where caterpillars and egg masses of gypsy moth were found for the first time at a mobile home park near Fayette. Officials said that the months were carried into the state on a mobile home from Connecticut. An emergency treatment program to prevent an infestation is underway.

GOLF COURSE DESIGN BROCHURE is a 20 page booklet prepared by Packard Inc., La Grange, Ill. for real estate groups and land developers concerned with proper design and construction of quality golf courses. It discusses how proper hazard placement, green construction and traffic patterns add to golfers' maximum enjoyment and challenge. Packard shows how each hole should challenge the best players, yet not frustrate or penalize average golfers.

Algimyein PLL-C Algaecide Registered By EPA

A new algaecide that remains soluble over a wide pH range at use levels and will attack and destroy most of the strains of algae commonly found in lakes has been registered by the Environmental Protection Agency.

The new product is Algimycin PLL-C and is being introduced by Great Lakes Biochemical Co., Inc. of Milwaukee, Wisc. When used at recommended rates, it is not toxic to most common fresh water and tropical fish, desirable aquatic plants, animals, birds or pets.

Treated water may be used immediately for watering crops.

Algimycin PLL-C can be sprayed on the surface of the water with most spraying equipment, or injected on the bottom of the body of water being treated. It is most effective when applied directly to the algae growth.

The manufacturer cautions that bodies of water with heavy algae infestations should be treated in sections.

COW MANURE vs. MILK

In spite of the spiraling cost of food and vegetables, milk continues to be an economical source of energy and vitamins, says the American Dairy Association. As an example, the average consumer in the state of Pennsylvania pays about 16 cents a pound for cow's milk in an average supermarket. Consumers in other states have bought milk for as low as 9½ cents a pound. In contrast to this, tomatoes in April cost 59 cents a pound and a 15 ounce can of peaches cost 35 cents.

While all this leaves the dairy farmer wringing his hands to pay bills, other enterprising farm managers are finding a way to make greater returns from Bossy. They've found that manure from the old girl has a greater use than the familiar agricultural shoe polish. Cow manure can be sold at a **profit.** And guess what? Going price in the Harrisburg area for dried cow manure in five pound bags is 19.8 cents a pound, or 3.8 cents more per pound than fresh, wholesome milk in area supermarkets.

Kind of makes us wonder if the farmer has had his hands on the wrong set of equipment all this time. The tail end appears to be the most profitable end—for the Green Industry.

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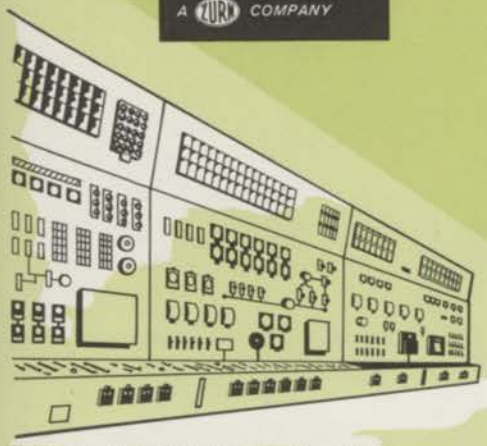

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The green Baron is here! Discovered in Holland and now grown in America exclusively by Lofts Pedigreed Seed, Inc., Baron Kentucky Bluegrass has been tested and acclaimed by outstanding agronomists in the United States.

Baron is a Kentucky Bluegrass unlike any discovered thus far. It germinates faster and reaches a deep green density ideal for sod, prestigious lawns and sports locations. It is slow growing and is especially adaptable to close mowing—as low as ¾".
Baron is winter hardy, maintains a fine winter color, and its leaves stay relatively unblemished by leafspot, rust, stripe smut, and gray snowmold.

Baron Bluegrass has sturdy broad blades which interlock to make a crisp surface ideal for holding a golf ball on the fairway.

In fact, in all respects Baron Kentucky Bluegrass from Lofts is the most remarkable grass seed you can buy. All Baron seed is CERTIFIED BLUE TAG, poa annua and bentgrass free.

A patent has been issued by the U.S. Federal Government for Baron Kentucky Bluegrass.

BARON cluster, left, shows abundant roots and rhizomes topped by sturdy, broad blades which have been mowed to about one inch, compared to common bluegrasses center and right.

Other newly improved varieties of grasses now available from Lofts include Jamestown Red Fescue, Exeter Colonial Bentgrass and Kingstown Velvet Bentgrass—all developed at the University of Rhode Island.

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